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THE

INDIAN FORESTER.

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Utilization of the less valuable Trees.

I desire to draw the attention of the readers of the *Indian Forester* to a large subject, which during my Indian career has often occupied me, I mean the utilization of the less valuable trees, of those which in forest reports are sometimes called *kokat* or common jungle trees.

It will be remembered that the first successful attempts on a large scale, to protect the forests against the annual fires, were made in 1865 by Colonel Pearson in the Central Provinces and were continued by Colonel Doveton. The Bori forest, south of the sandstone scarp of the Pachmarhi block in the Satpura range, gave us the first opportunity of seeing the wonderful effect of fire protection. When I visited Bori in company with Captain Doveton in the hot weather of 1869, the forest was a dense and compact mass of luxuriant growth, and the open spaces in it were rapidly filling up with seedlings and coppice shoots. And in Bori, as well as in other forests of the Satpura range, which it was at that time possible to place under efficient protection, this improvement has, I understand, steadily progressed. At the same time we saw what had been anticipated from the beginning, that the less valuable kinds, Terminalia, Anogeissus, Lagerstroemia, Nauclea, Garuga, Boswellia, Odina and the like, were profiting equally with those species that commanded a ready market, that is, with teak, Pterocarpus and bamboo. Similar results have followed efficient protection wherever protection was real and not on paper only. In the plains the common jungle trees, in the hills the inferior pines, multiplied equally with teak, deodar and other paying species. In places with a large fuel demand, such as Darjeeling, Chakrata and others, the inferior woods are sold as firewood or are made into charcoal, and in regions with dry climate, where forests are poor and scanty, and where consequently every stick is valuable, in Sindh and Rajputana, it did not much matter which species were favored by efficient protection. In most forest districts, however, the enormously increased production of the inferior woods threatened to become a real difficulty in the management of efficiently protected forests. Under these circumstances, it will readily be understood that the question of finding employment for those inferior woods has always appeared to me one of paramount importance. In the sal forests, where *Shorea robusta*, the most valuable species, is

gregarious, and consequently, as a rule, preponderates over the less valuable kinds, this question fortunately does not arise, the demand for kokat woods being generally sufficient to admit of what I would call uniform working. The same may fortunately be said of the forests of *Hardwickia binata* in Central and Southern India. But even in sal forests it has, I understand, at times been found difficult to dispose of the inferior woods which were cut or which ought to have been cut in improvement fellings. The last issue of the *Indian Forester*, on page 395 of Vol. XIX brings an interesting communication on the extension of wood pavements in Great Britain and the United States, for which purpose jarrah and other Australian timbers have, of late years, been largely imported. The writer justly urges that efforts be made to utilize such Indian timbers for wood paving blocks as have not yet, like teak, an assured and permanent market. As regards the harder kinds of wood, such as *Xylia dolabriformis* and *Terminalia tomentosa*, this is an excellent suggestion.

For the so-called inferior pines of the North West Himalaya their employment as Railway Sleepers and Telegraph poles, after impregnation with zinc chloride, copper sulphate and other antiseptic substances, is an obvious idea, considering the large extent to which impregnated wooden sleepers and telegraph poles are employed in many countries of Europe. Commencing with Dr. J. Warth's excellent paper, which he read at the Forest Conference of 1875, and which was printed in the second volume of the *Indian Forester*, numerous proposals for the impregnation of the Himalayan pines on a large scale have since that time been made, and the writer of these lines has certainly not neglected any opportunities to bring about the establishment of impregnation factories in Northern India. These efforts have failed : the desire on the part of the Engineers to employ iron sleepers was too strong, and the forest interest had no chance. Perhaps this is not to be wondered at, for even in North Germany, the iron sleeper has gained ground steadily and this has mainly been the case because the iron interest is more powerful at the present time than the forest interest.* I would, however, advise my younger friends in India and those Indian foresters whom I do not know personally, but of whose labours I read with interest in official documents, and in the *Indian Forester*, not to lose sight of this idea. Eventually, I feel assured that the impregnation of Himalayan pines and perhaps also of other woods, will come to be an important business in India.

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*In 1891-92 the total length of single lines on the State Railways of the kingdom of Prussia was 45,620 kil or 29,800 miles. On iron sleepers were laid 11,862 kil or 26 per cent. During the same year, 2,647,801 new sleepers were put down measuring 407,363 cu. metres solid wood, equivalent to 14,391,000 cu. ft. and costing 13,087,478 marks. Thus there is still a good demand for a considerable quantity of second class wood, and, fortunately, a large proportion of these sleepers is beech wood impregnated. The use of iron sleepers, however, has of late years made steady, though slow progress.

It is not impossible that the collection of resin and turpentine from some of the Indian pines may in some forests be the means of utilizing those species, the wood of which in the climate of the plains is not durable. I was glad to see in the Appendix Series, of the *Indian Forester*, a very useful paper upon this subject by Mr. Edgar Thurston.

And it is quite likely that factories of paper pulp may, in course of time, be established on some of the rivers which issue from the North West Himalaya. In many forest regions of Germany, the wood pulp factories established during the last 20 years have had a great and most beneficial effect upon forest management, by creating a steady demand on a large scale and at remunerative rates. Those forest students of Coopers Hill, who were with me on the forest tours between 1888 and 1891 may recollect the large number of wood pulp and cellulose factories in Saxony, in Bavaria, and in the Black Forest. Such factories have been built all over Germany wherever a sufficient supply of spruce and silver fir is readily available. The paper, upon which the "Times" is printed in London, is to a great extent made of cellulose and wood pulp manufactured in the Murg valley of the Black Forest. It will be remembered that about 1878 the paper manufacturers of Great Britain were in despair because the supply of linen rags, and of Esparto grass from Spain and Algiers, seemed quite insufficient to meet the rapidly increasing consumption of paper. A distinguished representation of some of the leading paper mills came to India, armed with strong recommendations from the authorities at home. Bamboo paper pulp was then regarded as the last resourse of the starving paper mills, and it seemed a national duty to make over the Bamboo Forests of Burma to the paper interest. The enthusiasm for bamboo paper, however, was of short duration. Wood pulp and cellulose factories had already been established, the article soon found favor, and the steadily increasing production of that article has entirely set at rest the apprehensions of paper makers in Great Britain. When, in 1890, the ravages of the "Nun" in the Ebersberger Park in South Bavaria necessitated the cutting and sale of 53 million cubic ft. of spruce timber, no difficulty was experienced in selling the first class timber at fair rates owing to the excellent arrangements made by the Bavarian Forest Department, but there would have been serious difficulties regarding the disposal of smaller stuff, if the large cellulose (chemical wood pulp) factory near Mannheim had not purchased nearly the whole of it. Wood-paper pulp in Europe is at present almost exclusively made of spruce and silver fir, but the wood used in the first instance was the Aspen, and it is not impossible, that besides the Indian pines the wood of some broad leaved species may eventually be utilized in this manner.

Iron making with charcoal perhaps offers, in most parts of India, the most promising field for utilizing the surplus wood, which eventually must be the result of efficient protection and good management. The subject has been repeatedly discussed in official and non official publications, but strange to say, no vigorous action seems as yet to have been taken. It is satisfactory, however, that the subject has lately again been prominently brought forward by Mr. Holland is No 8 of the Handbooks of Commercial Products. That portion of India where, in the interests of good forest administration and in the interests of the country generally, it seems most desirable to revive the old native iron industry, is the Madras Presidency, with its unrivalled deposits of rich iron ore and with its absence of mineral coal. When, in my Suggestions regarding Forest Admininistration in the Madras Presidency of 1883, in the Chapter 'Forests and Iron,' and elsewhere, I endeavoured to urge early action in this direction, I hoped that a few years' effective protection of the reserved forests in the Salem and other districts would make it possible to commence operations.

What I have been able to learn from the Annual Reports of the Madras Forest Department, from the *Indian Forester*, and from other sources, has been disappointing. As regards the drier districts, at least, I have looked in vain for evidence that the reserved forests have materially changed their character. I have nowhere seen any indication, that any part of them now forms dense compact masses of forest growth. Mr. Holland, on page 13 of his paper, gives extracts from a special report submitted to the Government of Madras in January 1892. In this report the timber fit for charcoal burning, that may be expected annually from the forests situated within convenient distance of the great iron ore beds in four Taluqs of the Salem district, is estimated at 20,000 tons a year. The area is given for two Taluqs only: *Salem Taluq* 47,800 acres, estimated to yield 5,736 tons a year, or 0·12 tons per acre; and *Uttankarai Taluq* 31,946 acres, estimated to yield 8,140 tons a year, or 0·25 tons per acre. Now, if these figures correctly represent the actual condition of these woodlands, forest management in the Salem district would not seem to have made very great progress since 1883. On page 177 of my Madras Forest Report, may be read a brief account of the Nimayampatti reserve in the North-east corner of the Salem district, on low hills at the foot of the Yelagiris, the standing crop on which, about 12 years old, was estimated at 2½ tons per acre, corresponding to a mean annual yield of 0·2 tons per acre, a very poor yield; the forest, however, had not been protected from fire.

The same yield, it was then expected (page 180), might be furnished under effective protection by a railway fuel reserve formed in 1866 and proposed to be extended to 50,000 acres, along the railway line at the foot of the Shevaroy hills. But

these were areas with very poor, stony soil. For those reserves in the Salem district, the produce of which would be available for iron making, an annual yield of half a ton per acre was estimated.*

Under the operation of the Madras Forest Act, good progress seems to have been made in the demarcation of reserved forests in the Salem district. Out of 2,578,000 acres of Government unoccupied land, † not less than 487,000 acres had, by 31st March, 1892, been declared reserved forests under the Act. The point, however, is, whether this large area or part of it has been protected efficiently Looking to the figures quoted above, this seems to be open to doubt. If indiscriminate grazing and cutting is permitted, it cannot be expected that the condition and production of forests will improve. Certainly, one of the objects in forming reserved forests in the Madras Presidency is to provide for the agricultural population in the vicinity a permanent source of supply of fuel, bamboos and building wood, and of cattle fodder, as far as this is compatible with the rational management of the forests. It does not, however, follow that for this purpose the whole area must be thrown open to grazing and cutting Selected blocks ought to be completely closed against grazing, and against cutting, as far as such may not be necessary in the interests of the forest, at least during a time sufficiently long to ascertain the capabilities of the woods thus treated.

At this time, ten years after the passing of the Madras Forest Act, which is acknowledged to be a useful enactment and one that meets the requirements of the case, and after the establishment of an organization, which is now generally admitted was a good one ; in the Salem district, at least, to all appearances no real progress has been made in the one essential condition of success in forestry, the determination of the annual yield of woodlands in different localities under efficient protection and under a good system of management.

As regards the Iron question, no operations on a large scale can be undertaken, unless the annual yield of the available forests is determined, and this was the first step which I urged should be taken in this matter. The second step was not to let the existing Native iron industry die out for want of fuel. Then two measures, the necessity of which I endeavoured to urge in my Report, are as necessary now, as they were in 1883. Certain carefully selected areas must be set apart and must not be touched, except where thinnings and improvement cuttings must be made. But, outside these selected areas, such arrangements must be devised, as will enable existing native iron works to obtain the necessary fuel for their operations. The proposals of my Madras Report, however, went further. I explained that if it were decided to leave the commencement of iron making operations on a large scale with improved methods to private enterprize, action must be

*Madras Report, p. 184. † Madras Report, p. 272.

delayed, until a sufficient area of forest had for some time been efficiently protected, and had attained a condition in which the required yield per acre could with certainty be depended upon as a permanency. My recommendation, however, was different. I urged that operations should be started on Government account for the improvement of the native method I suggested that an attempt might be made, gradually to improve the native process in the direction of making it less wasteful, by introducing the indirect process and employing blast furnaces of a moderate size, so constructed and arranged, that native workmen could keep them going. This idea was originally started by Dr. Warth, in a paper which he wrote in 1881, on "Iron making in India" At the same time, I submitted that this would require a metallurgist, practically conversant with charcoal iron making, to be attached for a time to the Forest Department of the Madras Presidency. This has not been done It is not for me to consider, whether the importance of maintaining and gradually improving the native iron industry has been sufficiently recognized by the Government of the Presidency. The subject has doubtless received due consideration, for, quite apart from the forest question, the interests of those classes and tribes in the different districts of the Presidency, which formerly depended upon iron making, seem to demand earnest consideration.

However this may be, my advice to the forest officers in those districts, where the old native iron industry has not yet been extinguished, is to devise means to prevent its extinction, and secondly to endeavour to introduce such improvements in the native methods of iron making, as will ensure greater economy of fuel Ball, in his Economic Geology of India, gives some data showing the great waste of charcoal in this process. On page 351, he draws attention to the excellent account given by Dr. Buchanan of iron smelting in Malabar, which he visited in December 1800, and where, in order to produce from 256 to 384 lbs of malleable iron, 1,890lbs of charcoal were used, which is about 6 times the weight of the iron obtained (Journey, Vol. II, page 438). On page 384, Ball describes the process in the Jabalpur district, where one maund of wrought iron requires, in the first instance, 6 maunds of charcoal to make kachcha iron, and then 4 maunds of bamboo charcoal for refining. And, on page 341, he states that in some cases the consumption of charcoal fuel for the production of finished iron is as 14 tons of the former to 1 ton of the latter.

It may be urged, that it is hopeless to effect any improvement and to introduce economy of fuel in the place of the present wasteful native method, considering the failures of the numerous attempts made in the Madras Presidency and in other parts of India, to establish a remunerative charcoal iron industry with improved methods. The discontinuance of operations at Porto Novo, Beypore, Trinomalai and Pulampatti, in Nimar, at Dechauri below

Naini Tal, in the Jubbulpore district and elsewhere, are certainly disheartening, but in none of these undertakings has the forest question been dealt with in the right manner. At the risk of being tedious and of saying things which each Indian forester knows, as well as I can explain them, I would urge once more, that the most promising tracts should be selected for the experiment in the first instance, tracts which, if properly treated, will produce a heavy annual yield. Even in Europe, there are very great differences in the annual yield of forests stocked with the same species. The spruce woods of the Ebersberger Park in Southern Bavaria, had, before they were attacked by the Nun, an annual yield of 50, while those of Weingarten in Southern Württemberg produced 1·0 cubic feet per acre. Whether the splendid Eucalyptus plantations on the Nilgiris and the Casuarina plantations in the plains have since 1883 been steadily extended and properly managed, I have no means of knowing; in those days I had good grounds for expecting, that over large areas, the former would yield annually 6 tons, and the latter 2 to 6 tons an acre. If large areas producing timber at these rates were available, it might pay to carry the more valuable iron ores to the places where the charcoal is produced. But all these are matters of detail, which must be settled on the spot, by persons acquainted with the actual condition of things at the present time.

In Europe, the employment of charcoal for iron smelting has within the last 60 to 80 years greatly diminished, mineral coal being now almost universally employed. Vast areas of beech forests, the produce of which formerly found remunerative employment in iron smelting, have to a great extent lost their value by this change, and it is in many instances difficult to dispose of their produce. There is a certain analogy between the beech in Germany and the inferior woods in India. The increased production of mineral coal has greatly diminished the use of beech wood as fuel, and has, in many districts, extinguished its use for iron smelting. An extensive area stocked with magnificent beech woods, called the Kermeter forest, situated in a bend of the river Roer, which some of the Coopers Hill forest students may remember, runs at the foot of the Hohe Venn and lower down, passes alongside the Hambach forest range near Jülich, formerly produced the charcoal consumed by a number of large iron works in the Schleiden valley. In those days, every stick produced here was utilized, and most of it was converted into charcoal made in large kilns which were established in the vicinity of the annual cuttings. About 40 years ago, the competition of iron made with mineral coal in other parts of Rhenish Prussia, became so severe, that the iron works in the Schleiden valley were gradually closed. Some of them have resumed operations, but are now working with coke brought from a great distance. In the Siegen country, the excellent ores found there, mostly spathic iron, were formerly

smelted with charcoal, mostly oak, the produce of the extensive coppice woods (Hauberge), which some of those Coopers Hill men, who accompanied me in 1888 and 1889, may perhaps remember. Here the Iron industry is as flourishing as ever, indeed it has latterly been developed on a very large scale. But mineral coal, which is brought from the coal districts near the Ruhr valley, has taken the place of charcoal. Changes of a similar kind have come about in England. The charcoal made of the Dean forest beech wood, was at the beginning of this century used in the iron works of the neighborhood, until it was replaced by the coal which was found underground in that forest.

Iron made with charcoal, however, has qualities which render it almost indispensable for certain purposes, hence the maintenance of charcoal iron works in Sweden, in Austria, and in some parts of Germany.

Some the Coopers Hill men may perhaps remember the large works at Jenbach in the Inn valley below Innspruck, which we visited in 1889. In Rhenish Prussia there are seven charcoal iron works, one (Jünkerath) in the Eifel mountain range, the other six in the country on the headwaters of the Sieg and the Lahn rivers. In 1892 these works employed 1024 men ; the ore worked up by them that year amounted to 33,308 tons, to which were added 2,082 tons of limestone, and they produced 16,834 tons of pig iron. The largest work, Müsen in the Siegen country, made 5,317 tons during the year. In one of these works situated near Dillenburg, 850 to 900 lbs of charcoal was used to make 1,000 lbs. of pig. The direct process of making wrought iron, which is the old native Indian process, has now everywhere been abandoned in Germany. It was nearly as wasteful as the Indian process, 100lbs. iron requiring from 300 to 800 lbs. charcoal. This, however, it must be remembered, was wrought iron.

A singular confusion would seem to exist in the minds of some writers upon this subject in India. Thus, a writer in the *Pioneer* of 20th March 1893, quoted in the *Indian Forester* of September last (page 340) places Dr Schlich's estimate of 2½ tons of charcoal required to produce one ton of iron against that given in my Madras Forest Report (page 57) *viz.*, 3½ tons. But Dr. Schlich, writing of the Barwai iron works in Nimar, spoke of pig iron (15 tons a day or say 5,400 tons a year) requiring 372,604 maunds of charcoal ; whereas I spoke of finished, or wrought iron. The same writer states that in the Blandfer furnace 16¾ cwts of charcoal were used for one ton of pig. This is about the quantity at the present time used in Germany. The quantity of charcoal required, varies with the construction and management of the furnace, the temperature of the blast, and many other circumstances : among others, the nature of the ore and the quality of the charcoal Assuming that, under good management and with the

best modern appliances, one ton of pig iron would require one ton of charcoal, an annual outturn of 10,000 tons would demand 10,000 tons of charcoal, corresponding to 40,000 tons of wood. This, however, is pig iron, which, on conversion, gives a smaller quantity of wrought iron or steel. Without entering into details regarding the fuel required for this process of conversion, which varies within very wide limits, it may be assumed that under favorable circumstances, and with the best modern appliances, 20,000 tons of charcoal may, by the indirect process, be made to produce 10,000 tons of wrought iron or steel bars. In 1883, the data then before me did not seem to justify so favorable an estimate, and I was right in assuming that 35,000 tons of charcoal would be required to make 10,000 tons of finished iron.

Regarding the area required to produce this quantity, there must be more data available now than I had been able to collect in 1883. I have, however, looked for them in vain in the Annual Reports, as well as in the pages of the *Indian Forester*. In 1883, I had before me the excellent valuation surveys made by Mr. Hutchins of the Casuarina plantations in the plains and of the Blue gum woods on the Nilgiris, as well as estimates which I had made of other woods on my journeys through Southern India. It has already been mentioned, that those data seemed to justify the assumption, that, while in the moist climate of the hills and on the sea coast, blue gum and Casuarina, if planted on a large scale, might yield, the one 6 tons, the others from 2 to 6 tons a year per acre, the woods in the plains at the bottom of moist valleys might yield 2 tons but that the yield of the whole of the tracts available for the production of charcoal would only amount to half a ton per acre. Beech woods in Germany, completely stocked, and well managed, have the following yield per acre on a rotation of 100 years, the produce of thinnings being included and all wood being reckoned down to 3 inches diameter.

Locality I	class	8·7	Cub. M.	per hect. or	124	cub. ft. per acre
III	„	5·2	„	„ „	74	„
V	„	2·2	„	„ „	31	„

corresponding to about 2½, 1½ and 3-10th tons per acre. Without any certain data regarding the annual timber yield under real protection, of the woodlands available to yield charcoal for iron works in the Salem district, it is useless to speculate upon the area required to yield 20,000 tons of charcoal a year corresponding to my 80,000 tons of timber.

It cannot, of course, be expected that the forest officers of the Salem and other districts in the Madras Presidency should possess that knowledge of metallurgical processes, theoretical and practical, which would enable them to teach native iron smelters economy in fuel.

The circumstance that the proposal submitted in my Madras Report, to associate with the forest officers in this business, a Metallurgist with practical knowledge of charcoal iron making, has not been acted upon, should not, however, prevent action being taken as far as possible. My advice to all forest officers is to endeavour to do as much in this direction as possible and for this purpose to seek the advice and assistance of the officers of the Geological Survey, and of others competent to help them in this matter.

The question has already been raised, whether the importance of preventing the extinction of the native iron industry is sufficiently recognized. Howsoever this may be, eventually it is sure to be regarded as a matter of great moment, and those forest officers who have had the wisdom and energy to take action beforehand, will then reap the benefit of their foresight. These remarks must not be held to be limited to the Salem district. On page 151 of my Madras Report will be found an account of the iron industry in that portion of Bellary which surrounds the Sandur hills. At the time of my visit, in December 1881, 41 furnaces were at work in this portion of the district. A notice in Watt's Dictionary of Economic products, Vol. IV page 506 (1890) says that the native iron industry in the Bellary district had become nearly extinct. Should this really be the case, it would be a fact much to be regretted. From Ball's Economic Geology and from Mr. Holland's paper quoted above, it is evident that there is hardly a district in the Presidency without considerable deposits of workable iron ore. And in other parts of India there is abundance of rich and pure iron ore in many places. The remarks here submitted more or less apply to all provinces.

I must claim the patience of my readers for yet another project for turning to useful account the wood of the less valuable trees in India. Some of those old Coopers Hill Forest Students, who accompanied me on the Forest tour of 1888, may perhaps remember that on our way from the Spessart to Aschaffenburg we visited a large factory at Laupach, where beech wood is subjected to destructive distillation, the produce being charcoal and empyreumatic substances, chiefly acetate of lime and lead. This factory consumes 5,000 cubic metres (stacked) of beech wood annually and thus is a valuable customer for a portion, at least, of the immense quantities of beech wood annually produced in the Spessart. Besides acetates, there are other products of the destructive distillation of wood in retorts and close ovens, which have a certain market value, and which may, perhaps, some day lead to the establishment of such factories in India. A cubic metre stacked of beech wood, air dry, which weighs 500 kilo. (35 cubic feet,

weighing 1,100 lbs.) if carefully treated in retorts, yields the following products :—

1. Charcoal	100 kilo or	220 lbs.
2. Pyroligneous acid, which, by the addition of chalk is converted into grey calcium acetate	25 „ „	55 „
3. Wood Naphtha (Wood Alcohol)	5 „ „	11 „
4. Wood Tar	15 „ „	33 „

The rest, less the weight of chalk added to make calcium acetate (2), consists of water and gaseous products.

Grey calcium acetate is used in dyeing and to manufacture other acetates mostly used for the same purpose. The present market price of this article delivered at a seaport in Germany is 18 to 22 marks for 100 kilos. Wood Naphtha is used for dissolving resins and for other purposes. Under good arrangements the fluid obtained by the process contains, in 100 volumes, 90 Methyl Alcohol 100 per cent, and the present market value of Methyl Alcohol thus obtained is 80 to 90 marks for 100 kilos. What here is called 100 per cent Methyl Alcohol, contains 80 per cent of the pure substance CH_3 (OH) mixed with about 10 per cent Aceton (CH_3. CO. CH_3) and 10 per cent of various other substances. These two substances will probably in India command a similar market price as in Germany. That mentioned under No. 4, wood tar, is likely to acquire special value in India. By the distillation of wood tar more pyroligneous acid is obtained, and from 35 to 40 per cent of wood-tar oil, a substance with powerful antiseptic properties. This wood-tar oil would, in the opinion of persons competent to judge, be an excellent article for impregnating woods in India, so as to make them durable, that is to protect them against decay and the attack of insects. Wood Tar oil contains the true creosote originally so called, because it was used to preserve meat. What is now generally called creosote is a different substance, the correct name of which is Phenol C^6 H (OH) or Carbolic acid. It is prepared from Coal Tar and is the substance used to impregnate timber in Europe. In the creosoted sleepers, which are imported into India, phenol is the antiseptic substance. Wood tar oil has also been used with success for impregnating timber in Europe. Indian mineral coal is, I understand, not sufficiently bituminous to yield phenol on a large scale, hence, in order to impregnate timber in India with the so called creosote, this substance would have to be imported from Europe. It might possibly be more economical to employ wood tar oil, which contains the true creosote.

In Germany similar results are obtained from the wood of oak and birch, that of oak yielding a little more wood naphtha and pyroligneous acid. The wood of coniferous trees on the other

hand, spruce, silver fir and Scotch pine, yield equal quantities of charcoal and wood tar, but much less pyroligneous acid and wood naphtha. It is probable that similar results will be obtained in India, and that, as far as pyroligneous acid and wood naphtha are concerned, the destructive distillation of the wood of broad leaved trees will be more profitable than that of the so-called inferior pines. I would, however, draw special attention to wood tar oil for the impregnation of timber. On the assumption that, broadly speaking, Indian woods will yield the same quantity of wood tar as is obtained by the destructive distillation of beech wood, 1,000 lbs of timber may be expected to yield 12 lbs tar oil, a substance which can be used for impregnating the wood of the less valuable pines of the Himalaya.

I have before mentioned the utilization of some of the beech wood of the Spessart hills, through the operations of the factory at Laupach. In old days, the beech wood was utilized in a much more simple manner. The oak timber of the Spessart has from time immemorial found a market in the manufacture of staves for wine casks required for the wine districts in the Rhine and Main valleys. In those days no roads existed in those hills, the oak staves were split on the spot and were carried on mules or on men's backs. In most places, beech was then, as it is now, associated with the oak, and to this mixture the splendid growth of the oak on the poor sandstone soil and in the severe climate of the Spessart must be ascribed. Utilization of the beech timber by export was out of the question ; it was however utilized on the spot on a very large scale by glass factories and for the preparation of potash. The procedure certainly was most wasteful. The beech trees were burnt, glass was made with this potash and the sand, which here was everywhere found on the spot. Where the forest in one locality was exhausted, the glass works were shifted to another place, and the work of destruction was commenced afresh. It was a system which somewhat resembled the shifting settlements of Karen *Toungya* cultivators : and the denudation of the soil, the result of this forest destruction, has, together with long continued practice of removing litter from the ground, had the effect of impairing the productiveness of the soil, particularly on the outskirts of the Spessart and in the northern more densely inhabited portion. To some extent, however, this wasteful system gave room to the oak and thus contributed to the maintenance of this, the more valuable tree in the Spessart, the only one, the timber of which paid for carriage over great distances and hilly ground in the absence of the present splendid system of roads.

What I have permitted myself in the preceding pages to set before my younger friends in India, will enable them to understand why, on the autumn forest tours which I had the honour of making with the senior Coopers Hill forest students, I made a point of showing them, not only the Laupach factory here mentioned, but

also the establishments for impregnating timber with antiseptic substances at Zurich and elsewhere, the wood pulp and cellulose factories in the Black Forest and the large charcoal iron works at Lenbach in the Tirol. For a forester in India, a knowledge of chemistry is even more necessary than for a forester in Europe. All these proposals for utilizing the less valuable kinds of timber are based upon processes of a chemical nature, and though it cannot, of course, be expected, that the forester should be competent to establish factories like those mentioned, he ought to be sufficiently familiar with chemistry, to form a judgment regarding the expediency of establishing work of that character in any given locality. The subject which in German Forest Schools is taught under the name of "*Förstlich-Chemische Technologie*" is even of greater importance for Indian foresters than for those employed in Germany.

Those who were in the Indian Forest Service in 1878, when I succeeded in getting the Dehra Dún Forest School established, may perhaps know, that the School was established in the teeth of long continued and powerful opposition. In the end, its establishment was only sanctioned on my assurance that the expense of the school would be covered by the increased income which would result from the more efficient management of the School forests. Yet under those difficult and straightened circumstances, I thought it right to insist upon the establishment of a Chemical Laboratory at the School, so as to enable students to become familiar with certain branches of Chemistry in a practical manner, by working with their own hands. Circumstances, I understand, have put an end to this most useful arrangement. This, I think, is to be regretted, because chemical analysis, more than almost any other occupation, is calculated to sharpen the powers of olservation, and to develope the habit of drawing conclusions from observed facts. Chemistry, apart from its showing the way towards a more profitable utilization of woods, which cannot be advantageously employed in construction or otherwise, is an excellent preparation for all practical pursuits which are based upon natural sciences, Forestry among the rest.

But to return to the utilization of the less valuable species. I am a little afraid, lest my anticipation of an inconveniently superabundant production of these trees through efficient protection of the forests, particularly against fire, may not have been altogether premature. I fear it is a fact, that the difficulty of utilizing the less valuable woods has not as yet been felt to the extent which I anticipated, when the effect of fire conservancy made itself felt in the Central Provinces, in North Western India and in Burma. And I apprehend, that the conclusion I must draw is, that improvement in the condition of the forests has not progressed as rapidly as I had anticipated. Should this be the case, then some of the suggestions which I have submitted in

this paper, must wait, until a portion at least of the reserved forests have grown into compact and dense masses of wood.

I have before drawn attention to the analogy existing between the less valuable woods in India and the beech in Germany. Fortunately, it is now an accepted rule of sylviculture, in Prussia, in Bavaria and in other States of Germany, that when beech forests are regenerated, a proportion of other more valuable trees must be introduced ; and that, where this practice already exists, the proportion of the more valuable kinds must be increased. Acting upon this principle, the oak, and in places the ash and maple, are sown or planted, where climate soil and other circumstances are favorable. Where this is not the case, conifers, the larch, the spruce, the silver fir and the Scotch pines are introduced. For maintaining the productiveness of the soil, the beech is most useful, but the money yield of the extensive beech forests in Germany is diminishing and this it is desired to prevent by associating with the beech some of the more valuable species. It goes without saying, that in India also the aim must be to incease the area stocked with teak, deodar and other valuable trees, where circumstances may permit of this being done.

The last remark I can imagine, may possibly be the only one that will commend the assent of some of those, who have had the patience to read this, I regret to confess, lengthy paper. Replace the inferior woods by those which are valuable, this I hear my critics exclaim, is the only sound and practical plan to follow.—Eradicate and extinguish the inferior woods and replace them by teak, deodar and other valuable kinds, is, however, easier said than done. And were it done, were pure teak forest, for instance, raised without bamboos and other companions, which tend to favour the growth of teak, as beech or silver fir favour the growth of the oak, the result would not be satisfactory.

Others again I hear object, that the questions here raised are altogether premature ; that under existing circumstances in India, the reserved forests cannot possibly form dense compartments like the forests in Europe ; that though fires are excluded, cattle keep down the young growth ; and that with the increasing population in the vicinity of the forests, uncontrolled cutting and lopping continues as heretofore. To this, I reply that the key stone of forest policy in India, concentration of efforts upon limited areas, seems somewhat to have been lost sight of. I have no doubt that there are, in every division, nay, perhaps, in every range, blocks which can not only be protected against fire, but can be closed completely against cattle and irregular cutting. The improvement which is sure to take place in these blocks, will pave the way for the good management of the remainder. If this principle is generally acknowledged and steadily acted upon, the question of utilizing the inferior kinds must sooner or later arise, and it can only be dealt with by action in the direction here indicated.

So far, some of my readers may go with me, but they are startled by the hint, that in these matters, it is for forest officers to take the initiative. They would prefer to wait, until they received distinct instructions from government, to arrange for the supply of wood, so as to prevent the extinction of the native iron industry, to establish factories for the manufacture of wood alcohol, calcium acetate and wood tar oil, to make wood pulp and to arrange for the impregnation of the inferior pines. Perhaps I may be able to set at rest the doubts of some of these anxious minds by mentioning a few facts from my own experience in the Indian public services, which tend to show, that under certain circumstances, it is the duty of a public officer to stick to a certain line of action, as far as such is compatible with the obedience, which every public servant owes to the Government he serves. Such firmness, however, is only justified by the conviction that the line of action maintained by him will promote the prosperity of the country and will secure the well being of its inhabitants. And, as a matter of course, success in such cases is impossible, where the line of action is dictated by selfish motives.

Soon after landing at Calcutta in December 1855, I had the honor of explaining to Lord Dalhousie, the then Governor-General, the outlines of the first measures which I proposed to take in order to place the management of the Pegu Teak Forests upon a permanent footing. He listened with great attention, and when I had concluded, he fixed me with his piercing eyes and said :— "Dr. Brandis, if you succeed in carrying out these excellent plans, 'you will confer a lasting benefit upon the people of Pegu I hope 'you may succeed, and you will have my full support in the 'matter. I hold it to be the duty of the Government of India, to 'preserve the forest resources of Pegu, and not to allow them to be 'wasted, as the forest resources of other provinces have been wasted. 'Unfortunately, I must leave India soon, but I trust that my 'successors will take the same view as myself of the Pegu forests. 'Should it, however, thus happen, that at any time the Government 'of India were not fully alive to the necessity of preserving the 'forest resources of Pegu, I hope that you will remember what I 'have told you." Lord Dalhousie left India in March, 1856, and died in 1860.

The measures which, under the orders of Major, afterwards Sir Arthur Phayre, I introduced in Pegu, gained for me the confidence of the Karen and other inhabitants of the forests, for I gave them profitable employment under Government in the working of the forests, and thus made them my allies instead of enemies in regard to forest protection. The merchants of Rangoon, on the other hand, soon commenced a vigorous opposition against the system introduced by me. Personally, I made a point of keeping on good terms with them, and they tried hard to persuade me to allow them to cut the mature timber standing in the forests. With

much show of reason they contended, that ships built of wood would soon be a thing of the past, that iron would, in ship building, as well as for all other purposes, replace the use of wood. At that time, the Sepoy mutiny of 1857 had saddled the Government of India with an enormous debt, and the disturbed state of the country had diminished the revenue from many sources. Under these circumstances, my friends urged that the only proper course was to take advantage of the high market rates of teak then ruling and by the sale to them of all the mature standing teak timber, to realize large sums, and thus to create an immediate source of revenue. More than this, the impulse which a business transacted on so large a scale would give to the prosperity of Rangoon imperatively demanded the acceptance of their proposals. They appealed to my devotion to the interests of the Government which I was serving, to my ambition and to my common sense, and they pictured in the darkest shade the disastrous consequences of a refusal to back their proposals Within a few years the demand for teak would diminish, prices would fall, and in the end teak would be a drug in the market and the teak forests would be valueless.

When my friends found that I remained firm, and that Major Phayre, the Commissioner, refused to yield to their representation, they went to Calcutta, and, backed by the influence of the large and powerful mercantile firms of Calcutta, they succeeded in inducing the Government of India to order the Commissioner to throw open the Pegu forests to private enterprize. The orders were sent to Rangoon in February, 1861 These orders had to be carried out, but fortunately we were not required to throw open the whole of the forests at the same time. Nor were we required to make arrangements for more than a limited number of years. By that time, incessant hard work from 1856 to 1861 in examining the forests by means of linear valuation surveys, and by constant height measurements, had taught me which districts were valuable, and which were less so, and this knowledge enabled us, the Commissioner and myself, to frame a good plan of operations. The forests west of the Irawaddi river which, though very extensive, were the least valuable, were given upon 12 years' leases with the permission to girdle. In the eastern Prome forests, those on the Hline river in the Rangoon district and those of the Sitang valley, permits, in some cases for 3, in others for 6 years, were given to cut the timber girdled by the forest officers, so that the power over the green standing trees was reserved to Government. The forests on the Zamayee and Paunglin areas and those in the Tharawadi district, which were the most valuable, were for a time retained in the hands of Government.

In November, 1861, the proceedings of the Government of India were reported to the India office. Here a different view of the matter was taken, and the disastrous effect which these measures must have upon the forests was at once recognised. In a

remarkable despatch of 24th March, 1862, which is published in a Parliamentary Blue Book on East India Forest conservancy of 1871, the Government of India was requested to reconsider matters. Thus the Tharawaddi and Zamayee forests remained in the hands of Government. In the other forests, the leases and permits, which had been given in 1861, had of course to run their course, and in some instances they were afterwards renewed, but in the end the whole of the forest came back under the control of the Forest Department.

The wording of the permits, under which the Sitang and other forests were made over to the large mercantile firms of Rangoon, had been framed with the greatest care, yet the foresters employed by the permit holders commenced girdling and cutting green trees on a large scale. This necessitated legal proceedings, which led to the discontinuance of the system. In my Report on Forest Administration of British Burma for 1861-62 page 37, after giving a brief account of the action taken in obedience to the orders of Government, I had justly observed, that the conservancy of forests under the permit system is secured by written documents only, while in forests, worked on Government account, the forest department remains in actual possession.

It is the peculiarity of forest management, that trees require a long time to come to maturity, and this circumstance imposes upon foresters the duty of looking ahead, and carefully considering the future prospects of their charge. Upon them, therefore, in the first instance, devolves the duty of taking the initiative in all important matters, as far as such may be compatible with that loyal obedience which they owe to the Government they are serving. What I have here related concerning the first period of my public career in India, may, perhaps, serve to illustrate what I meant to impress upon those foresters in India, who have at heart the progress of the magnificent British Indian Empire and the well being of its inhabitants.

D. BRANDIS.

The Hill Forests of Java.

(*A translation from the Först und Jagd Zeitung.*)

These forests may be conveniently sub-divided as follows :—

1. The moist forest between 2,000 and 5,000 feet elevation.

2. The forest in the cloudy region between 5,000 and 8,000 feet elevation.

3. The vegetation on the summits of the mountains over 8,000 feet elevation. These headings will be again sub-divided, if necessary, by the position of the forest in East or West Java.

(1.) The Forests between 2,000 and 5,000 feet.

The forests at an elevation of from 2,000 to 5,000 feet are those in which the rainfall, at least during the north-west monsoon, is greatest. Above 6,000 feet, the moisture-laden winds do not blow, and at 5,000 their effect is much reduced, although occasionally the highest peaks are hidden in clouds. The virgin forest, which originally covered this region, has been already seriously interfered with ; at the lower elevations, coffee is grown and in the higher localities cinchona is cultivated, but in places types of the natural forest may still be seen. The moist forests of Java contain the largest tropical growth, it is here that a luxurious vegetation is enabled to flourish owing to the advantages both in moisture and in temperature In comparison with the forests of Europe, the density is less and this is accounted for by the excessive production of foliage in contradistinction to that of timber ; climbers which, of all forms of vegetation, are the most dependent on heavy rainfall, attain enormous dimensions and seriously affect the density of the forest. But even the trees themselves bear the impress of excessive moisture in the peculiar buttresses, which are absent in the drier regions, but may be taken as characteristic of the forest growth where heavy rainfall is the rule. Epiphytes also, which are common in this region both as shrubs and trees, chiefly Ferns, *Medinilla*, *Fagræa*, *Sciadophyllum*, and *Rhododendron*, are a form of vegetation which cannot exist without moisture ; and finally, the size of the leaves is dependent on the quantity of moisture for in no other region are the leaves so large as in this moist zone, although they do not attain such remarkable dimensions as in the damp forests of the Brazilian coasts.

The forests in the moist zone contain both the true tropical species which are common throughout the island and the more temperate species such as *Amentaceæ*, Conifers, *Laurineæ*, and *Ericaceæ* ; but these latter are generally found only in the more elevated portions of the zone. *Altingia excelsa*, with a stem of often 100 feet high, towers above the other forest growth, with its

branches hung with moss and adorned with the crimson flowers of *Rhododendron javanicum*. The more common *Gordonia Wallichii*, though a smaller tree, is no less striking on account of its constantly renewed large white blossoms which remind one of the tea flower. The various species of fig, recognizable from their aerial roots, are frequent in this region ; as well as other trees which, similar to some kinds of fig, bear blossom and fruit on their stems. The *Meliaceæ*, *Magnoliaceæ* and *Anonaceæ*, the last two being chiefly represented by climbers, show this peculiarity in flowering. The observer, however, cannot always without felling the trees determine with any great accuracy the nature of the leaf canopy ; but it is believed that the highest trees of this region belong to the following species, Ferns, *Canarium*, *Thespesia*, *Dipterocarpus*, *Epicharis*. The smaller species are much more numerous and belong principally to the families *Myristicaceæ*, *Tiliaceæ*, *Sapotaceæ Rubiaceæ*, *Euphorbiaceæ*, *Byttneriaceæ*, *Lauraceæ*, *Mimoseæ*. The numerous climbers are as difficult to identify as the trees unless they have some characteristic such as the oval excresences of *Vitis pubifera*, or the thorny hooks of *Uncaria*, or the stem blossoms of various *Anonaceæ and Magnoliaceæ*. Of Epiphytes, the larger varieties have already been mentioned ; of the smaller are orchids and *Aeschynanthus* especially common, as well as ferns, *Asplenium*, *Platycerium*, etc, and *Lycopodia* ; the last often hanging from the branches in festoons over 3 feet long.

But the epiphytic vegetation is not so rich in Java as in Brazil or in the Antilles owing chiefly to the absence of *Bromeliaceæ*. The dense undergrowth comprises a bewildering admixture of species ; *Urticaceæ*, *Piperaceæ Myrsineæ* are very numerous but not otherwise remarkable ; but the coral red inflorescence of many bushy shrubs of *Pavetta* strikes the eye at once, as well as the orange flowers and large white calyx of the *Mussænda*. Other Rubiaceæ, like the violet flowered *Lasianthus*, are distinguished by the disgusting odour given out when the leaves are bruised. There are a few small palms (*Pinanga*) and tree ferns (*Alsophila*). But the most remarkable part of the undergrowth consists of giant monocotyledons (*Musa*) which are never found in flower or fruit ; besides *Zingiberaceæ* (*Alpinia*, *Elettaria*, *Costus*, *Zingiber*, *Hedychium*, *etc.*) These species of *Zingiberaceæ* which frequently attain a height of 12 or 15 feet, form small clumps under which few other species can exist. Between the dead leaves which cover the ground may be seen the red and yellow inflorescense of *Costus globulus* and various kinds of *Elettaria* ; other similar flowers are almost hidden in the soil, whilst stretched out in the shape of a star the open fiery red blossoms of *Elettaria coccinea* may be observed. In some of the varieties of *Zingiber* the flowers are spiculated or stalked. All these flowers are shiny and often half rotten, similarly to the epiphytic *Bromeliaceæ* of Brazil.

It is not possible to treat of the lower vegetation, grasses, etc., but, as a rule, the soil between the shrubs and clumps of superior

vegetation is covered with a carpet of herbs chiefly of the following kinds, *Urticeæ*, *Cyrtandra nemorosa* and ferns, whilst *Begonia robusta* is also common ; springing from this level green covering taller shrubs are noticeable, such as *Pollia thyrsiflora* with its cobalt blue fruit and its white blossoms ; *Dianella montana* with similar colouring of fruit and flower ; *Disporum multiflorum* with its hanging bells of violet ; *Polygala venenosa*, etc.

If the leaves of this miniature forest are drawn to one side, the brown, damp and half rotten humus is visible The space between the shrubs and herbs is great, although from above the soil appears to be well covered ; yet small plants, moss, etc., does not grow, neither are ground orchids remarked ; and yet one is surprised to observe under the leafy canopy the large white blooms of *Cyrtandra nemorosa* which spring from the base of the stalks of this plant. Where the stems of the *Saurauja cauliflora* are visible, the large white and red blossom which springs from its base is often hidden by the dense leaves of *Elatostema* and *Cyrtandra* and, under this shelter the insect life supported by these blossoms may be seen.

It is evident from the observations made that the forests of the moister zone, although they do not possess so high a temperature as those of the plains, yet, in their systematic composition, show a thoroughly subtropical character, whilst various characteristics such as buttressed stems, large climbers, woody epiphytes, etc., peculiar to regions possessing a large rainfall, give to them many of the traits of moist tropical regions.

(To be continued)

Protected Forests.

It was very gratifying to find an answer to the article on Protected Forests in the August number of the *Indian Forester* from so able an authority on the subject as Mr. Baden-Powell: anything from his pen is always important. He admits that the article in the main justly supports the point contended for, which being the case, nothing more need be said, affecting the particular issue, as no question of rights are at stake : none were ever awarded on these ever-changing areas and never will be, it is imagined, although a Forest Settlement Officer once *did* endeavour to grant certain rights ; but his decisions were without the slightest difficulty upset on appeal. Concessions innumerable, however, have been given, which cause, it is thought, almost as much trouble as rights ; and in this connection Mr. Baden-Powell's remarks at page 146 of Volume XVIII of the *Indian Forester* are worth a persual.

The award of concessions wholesale in localities where a Working Plan has to be enforced, only brings the Forest Department into disrepute with the people, and the Revenue and Forest Officers into conflict.

But, wherever the locality be, forests when placed under systematic treatment and especially where numerous concessions have been awarded, are bound to be the cause of a certain amount of discontent and dissatisfaction which must be put up with.

Circumstances now can scarcely be as they were 50 or 60 years ago when the country possessed no railways and no large industries. Cultivation was then very limited and the population sparse: cattle were allowed to graze at will, and the people to remove what was wanted from the jungles without restriction.

As they had been accustomed to this hand to mouth policy for so long remonstrance naturally came when the old habits were suddenly arrested; but habit is overcome by habit as a great worthy has said and the habit of economy and self denial must be inculcated into them, if it be required to retain forests permanently and if the existence of future generations is not to be jeopardized.

It is only where forests are administered in a haphazard and lax manner that perfect tranquility prevails; instead, therefore, of being satisfied with the condition of things in such localities, it behoves the Government to look into them and ascertain how things are progressing. The idea which exists in England, and in the minds of many, that the annual yield only, and not the forest capital in India is being exploited everywhere, is, it is thought, rather incorrect. Several places may be named where all is confusion and where valuable forest property is fast disappearing for want of a Working Plan. A great stride toward betterment has been made during recent years, it is true; but the progress is slow, and without a larger establishment and more expenditure, some of the valuable state property will be found to have disappeared by the time a working scheme has been introduced. It is not intended to bring a charge of neglect against any individual or body of individuals with regard to the manner in which many District are administered; the real facts are that Districts are too extensive and the executive duties af a Divisional Forest Officer are so heavy that time does not permit, nor does the establishment at command enable, a Working Plan to be even started. But to return to the question of the forests on the alluvial lands which were alluded to in the April (1893) No. of the *Indian Forester*; and whose character was assumed to be temporary another aspect of the question has revealed itself with regard to them when judged in conjunction with proprietary right in the soil which rather disturbs the original theory and justifies their claim from a forest point of view to be considered permanent. The forests on these lands, it will be remembered, are all reserved under Act VII of 1878; and as property right in the soil exists down to the centre of the earth would

any washing away of land, *i.e.*, change in the river's course, interfere with the right of the Forest Department to the land alleged to be removed? As explained in the article, a forest has been known to exist on one side of the river and Government waste or Zemindari property to be on the opposite bank. The river suddenly changes its course, and flows *over* the forest property, cutting off as it were a slice and leaving an addition to the property opposite. According to the rules in force, the Forest Department loses the land cut off; but is this legal? The land below water and the portion above on the opposite side, up to the extent of the area gazetted, is apparently *still* forest property, the water merely being an accidental or temporary surface covering for a few seasons.

In like manner, can an addition to the forest area result by the action of the river? Any addition to a properly constituted Reserved forest cannot be made, legally speaking, except by notification in the Gazette, nor can any exclusion be permitted except with the sanction of the Government of India. Year after year, however, administration reports are reviewed by Government with these changes shown, yet no notice has been taken of them. It sometimes happens that a forest gazetted as Reserved disappears entirely, as was the case with one of over 1,000 acres which was constituted in 1878. A map of the forest may be found in the Divisional forest office and its position on the river bank is defined on all the old maps of the Taluka. Year after year the river crept further in, until at length the whole area disappeared.

Shortly afterwards it began to retire towards the opposite bank again, leaving alluvial land where forest property originally existed; but there being no mark nor indication of any sort to identify the former existence of any forest, the new deposit was claimed as an accretion to the village lands adjacent and accordingly the forest became permanently effaced. The re-formed land may be said to be merely a deposit on the surface of what was once reserved forest; but according to existing Rules the forest is gone for ever. If, as already stated, proprietary right in the soil exists down to the centre of the earth, cannot the Forest Department claim the new deposit by taking measurements and laying down the boundaries as originally demarcated even though there be no sign of any former boundary marks? The question as now briefly explained, was advocated recently by a very capable member of the Civil Service and one who possesses considerable knowledge of Forest Settlements; and it has such an important bearing on the constitution of Forests in localities similar to the one under reference that it would be interesting to have an expression of opinion from Mr. Baden-Powell on the subject, if he will condescend to offer one.

G. E. M.

II.—CORRESPONDENCE.

Tour in Jaunsar.

SIR,

I have read with interest Mr. Fernandez's criticisms on the Forest School tour notes for July and August 1893, and beg to forward a few remarks on the matters referred to by him.

Your correspondent enlarges upon the "generally unsatisfactory results of the Jaunsar Deodar plantations" but in this respect, I think any one who has examined, in detail, these plantations; compared them with other deodar plantations elsewhere; and also considered their cost, will agree with me that Mr. Fernandez is labouring under a mistake. I admit that his disparaging remarks apply to such places as the bare slopes of Bodyar and Korwah, where the natural conditions are most unfavourable for the growth of deodar, but I think every one will admit that some of the older plantations such as Konain, Koti Kanasar, Deota and Lorli are as successful as could be expected.

The comparative cost also of these plantations should be considered, as they have in no case exceeded Rs. 30 to Rs. 40 per acre, whereas, I understand, the successful plantations Mr. Fernandez refers to elsewhere, have cost at least Rs. 100 per acre, which makes a considerable difference.

I quite admit the truth of Mr. Fernandez' remarks about the great advantage of using good strong nursery plants, especially when the conditions are not very favourable, always provided they can be handled properly by skilled workmen. It, however, often happens that at the critical time when the planting has to be done, one is obliged to employ ordinary untrained coolies, who invariably cut or damage the big roots and the result is eventually much less satisfactory than if smaller plants had been used.

Under the circumstances, therefore, it has been customary in Jaunsar to use plants varying from 12 inches to 18 inches high, which dimensions are usually attained by plants growing in favourable nurseries is about 2½ years.

The following is a statement of the progress and treatment of the young plants in the nurseries previous to planting out in the Forests.

The seed is sown in November and germinates in the following March and the young seedlings are pricked out in the nursery beds during July, 6in. × 7in apart.

These seedlings are again pricked out during the following July, 9in. × 6in. at which time they are 16 months old.

During the following July or when the seedlings are 28 months old, most of the plants, if grown in favourable nurseries, will have attained from 12in. to 18in. in height, and are then considered fit for planting out in the Forests.

All plants which are not vigorous enough for planting out are again transplanted and left for another year in the nurseries.

As regards the planting out of basketted plants, I explained the method in a recent article in the September number of the *Forester*, and from that letter it may be seen that the average age of basket plants when put out in the jungle is two years.

Under the circumstances, therefore, the writer of the School tour notes was not far wrong in his statement that plants "about (*not "only"*) two years old, were ready to be put out in the Forest." Of course, I am willing to admit that good 3 to 4 year old plants, if planted out carefully, will give better results than 2½ year old seedlings, but taking into consideration the chances of damaging the roots of big plants, and the extra cost, I think that after all, the smaller plants, if vigorous, are probably the best to use on a large scale.

Regarding your correspondent's observations about the failure of blue pine plantings, perhaps it will interest him to know that we have tried large kail plants also with unsatisfactory results. The fact is that blue pine has got very tender rootlets and is not suitable for rough treatment by unskilled workmen; and probably, after all, sowing "in situ" is the best method for the propagation of this species.

Regarding your correspondent's concluding remarks about the probability of blue pine seeds having been carried to Lorli from Matkangra, through the agency of birds, I have carefully considered the matter, and think there is a good deal to be said on both sides of the question.

In the first place it should be noted that the heights of Matkangra, from which the seeds are supposed to have come, are not more than 1½ miles distant and possibly there were several trees nearer at the time the Cantonment was started. Again, it does not seem to me to be very conclusive evidence that because the jungle crows referred to shewed a decided partiality for gnawed chicken bones, that they would take the trouble to carry kail seeds in their beaks all the way to Lorli. In my opinion, it is more likely that the seeds might have been deposited by Himalayan nutcrackers or chir pheasants who feed greedily on blue pine seeds, and might, therefore, bring them from a great distance. It is nevertheless a well known fact that winged seeds are often carried long distances by the wind, but after what has been said above, I am rather inclined to attribute the appearance of blue pine seedlings in the Lorli Block to Mr. Fernandez's bird theory.

E. Mc A. M.

NOTE.—We confess to believing ourselves, that the wind theory is the most likely one. And, as regards transplants, it is not a question of *age* at all, but of *size* : it we can get big enough plants at two years of age, we certainly ought not to wait till they are 5 years old before planting out in order to carry out a theory.

HON. ED.

Recruits for the Forest Department.

A correspondent, writing with reference to the article on this subject in our January Number, says as follows :—

In *Truth* of 21st December, I find the following remarks on the last reports of the visitors of Woolwich Academy and Sandhurst College.

" The conclusion to be drawn from these reports is that the 'teaching of both the Military Schools is defective in almost all 'essentials, and that our Officers are to a corresponding degree ill-'educated and inefficient. So it must continue to be while the 'entrance to these Schools is regulated, not with a view to obtain-'ing lads well grounded in the subjects on which Military Educa-'tion rests, but with the view of maintaining the aristocratic tradi-'tions of the Service, and suiting the convenience or the whims of 'one class of Schoolmasters."

It is precisely by suiting the convenience and whims of one class of Schoolmasters instead of obtaining lads well grounded in the subjects on which a Forester's education rests, that the authorities are making mistakes in the recruitment of our service.

A new Himalayan Beverage.

DEAR SIR,

The other day I noticed some Kanawaries drinking what I thought was tea, but which turned out to be a liquor made from a hard gum-like substance found in hollow and decayed stems of the birch, walnut and oaks; that obtained from *Quercus Ilex* is called " Brechi" and that from *Betula Bhojputra* " Chhatub"; the latter is said to be preferred, while the former, besides being used as tea, is sometimes employed in making writing ink. A pinch or two of either " *Brechi*" or " *Chhatub*" put into a cup of boiling water produces a liquor very much like strong tea in colour, but of no particular flavour.

I am sending specimens, which I request you will kindly have examined, as perhaps these gum-like exudations may be of some importance as an economic product. It is well known that in Kanawar and Thibet, an infusion made from Yew bark is drunk by the people, and it is believed that both this bark and a substance similar to " *Brechi*" and " *Chhatub*" enter into the composition of the Thibetan brick tea.

G. G. MINNIKEN.

III.—OFFICIAL PAPERS & INTELLIGENCE.

Usar Reserves at Cawnpore and Aligarh.

The following report was recently drawn up by Mr. J. F. Duthie, Director, Botanical Department, Northern India, as the result of a visit to the Usar reserves at Cawnpore and Aligarh. Mr Duthie's conclusion that the importance of protection has not been sufficiently appreciated, is only a confirmation of the views which find expression in the Government of India Resolution No. 16A, March 1st, 1883, on the injury done by cattle and goats to the grass lands of the country. In this Resolution it is stated that "In the North-Western Provinces various experiments have been, for three years, conducted by the Agricultural Department, with the view of reclaiming *usar* or *reh* lands. It has been found that the simple expedient of enclosure is more efficacious than any other operation. The natural grasses which, so long as the land is accessible to cattle and goats, are nibbled down as fast as the young shoots appear, spread in the enclosed areas at a rapid rate over the worst land. After two years, experimental cuttings gave a result of 20 maunds of good hay per acre—an outturn which, on a square mile, would suffice to feed 1,000 cattle for three months, exclusive of the bushes and trees which, there is good reason to believe, can be grown when once the grass is well established.

Juhi (*Cawnpore.*)—A careful examination of the grass vegetation in the experimental plots, gave evidence of still further improvement as compared with results previously recorded. There are now very few bare-looking patches, and none can be found which are absolutely so. In fact, a large portion of this reserve may now be considered as practically reclaimed. Mr. Miller, Director of Agriculture, who is also of this opinion, intends, I understand, to have a portion of it broken up at once for cultivation.

In November 1891 I selected two of the plots (Nos. 39 and 49) for experimental sowings of certain kinds of indigenous grasses. The ground was prepared and the seed sown according to instructions given, but, as the water-supply failed, the results were also a failure.

Chherat (*Aligarh*).—As the cattle employed in connection with the Dairy Farm here have been allowed to graze over the greater portion of this reserve, the grass growth now appears very scanty compared to what it used to be. The question of grass

grazing in India requires, I think, more care and attention than it has hitherto received. In this country the indigenous grasses of pasture lands have a much greater struggle for existence than those of more temperate climates, as in Europe for instance. In the plains of Northern India the grass vegetation is exposed to alternate periods of extremes in temperature, and often to excessive moisture. The people of this country take no care about the preservation of pasture land. Their one idea seems to be to let their cattle eat up or tread down every green blade as soon as it makes its appearance, until at last nothing remains for them to eat. The tread of cattle is injurious at all times, but more especially when the young shoots are beginning to unfold. Reproduction is then literally nipped in the bud.

On the low-lying parts of the Chherat reserve, where the ground is under water for a considerable time during and after the rains, I found that the *bat* grass (*Diplachne fusca*), which thrives in such situations, had spread very much since my last visit. It is a good fodder grass, and should be encouraged.

The plantation of seedling Date Palms is doing fairly well but they still require attention, and should be watered occasionally during the hot season.

Gursikran (*Aligarh*).—The condition of the ground occupied by the experimental plots continues to show improvement as regards the extension of grass growth. Many spots, which five years ago, were absolutely bare and efflorescent, are now completely covered with grass.

The area containing the experimental plots was purposely selected in 1888 on account of there being included in it a large number of bare and efflorescent spots; there were also several patches of dub grass and other kinds, besides the characteristic usar grass; and extending through some of the plots there were several lines of depression acting as drainage channels, on the slopes of which dub grass was plentiful. The varied nature of the vegetation has, according to my observations, acted very materially towards bringing about the generally improved condition, year by year, of this portion of the reserve. The greater part, however, of the Gursikran reserve is entirely covered with the ordinary usar grass (*Sporobolus pallidus*) which grows excellently well, and produces heavy crops every rainy season. The uniform character of the soil over a large area, and the absence of competitive influence on the part of other kinds of grasses, tend to encourage the luxuriant growth of the usar grass, and those portions of the reserve which are thus exclusively occupied by this grass appear to me to be incapable of further improvement by means of protection alone.

As a fodder-yielding species this grass has not been fairly tested. It is said to be too coarse for making into hay, and certainly it is so when cut after the rains are over, which is the usual custom in this country. As it is known to be a good grazing

grass, we may presume that it is fairly nutritious. If, therefore, owing to damp weather during the rainy season, it cannot be made into hay at the time when it should be cut, it might be preserved in silos, as I suggested some years ago in the Introduction to my book on the Fodder Grasses of Northern India.

The ultimate aim, however, in all attempts to reclaim what is now uncultivable usar land is to render it fit for cultivation. The successful results which have recently been obtained at Cawnpore and Aligarh are encouraging; the ground at Amramau is now under cultivation; the greater portion of the Juhi reserve may be considered as practically reclaimed; and considerable progress is being made at Chherat. The area thus affected constitutes, however, a very small fraction of the three million acres waiting to be reclaimed in these Provinces.

There can be no doubt that, as a preliminary measure, the protection of waste usar land from cattle does wonders, and at the Juhi reserve it may be considered to have done all that was required. But in the case of extensive areas, the soil of which is uniformly bad, or where the vegetation is exclusively composed of the ordinary usar grass, some further remedy is needed to supplement the good effects of protection.

If expense were no consideration, the reclamation of reh-infected tracts might be brought about speedily in a variety of ways. A thorough system of sub-soil drainage would probably have the desired effect. This idea was suggested many years ago, but I am not aware if any steps were taken to have it tried on a sufficiently large scale.

Another proposal was to cover the land with silt. This has been carried out with considerable success in certain localities within reach of canals, and with aid of water as a vehicle.

A more recent suggestion made by Mr. Gladstone, Deputy Commissioner of Umballa, is to plough into the reh soil a top dressing of river sand. Mr. Gladstone maintains that the sand will act beneficially on the soil as a dilutant; and so, by diminishing the relative strength of the noxious salts, a soil will be produced which will support vegetation, and lead ultimately to its cultivation. The cost of transporting the sand would, of course, be a heavy item but Mr. Gladstone is of opinion that results would more than cover expenses. An experiment on a small scale is now being tried at the Chherat reserve.

The demand for cultivable land will in time no doubt necessitate the adoption of more extensive measures for the reclamation of usar land, the costliness of which is at present the only real drawback. In the meantime, however, I would recommend the continuation of experiments with various plants such as are likely to thrive in reh soils. As a promising example, I would mention the *frásh* (*Tamarix articulata*), a common tree in the Punjab, where it thrives well on saline soils. It is easily progagated either from seed or by cuttings, and is a quick growing tree.

Sir D. Brandis, in the Forest Flora of North-West and Central India, page 22, says that the slender twigs are frequently hoary with saline efflorescence. He also mentions that the wood is strong and durable, and is used for making ploughs, Persian wheels, and other articles; and that when well seasoned it makes good fuel. The bark is used for tanning, and the galls produced on the branchlets are employed as a mordant in dyeing, and also in tanning. The seed of this tree is obtainable during the rainy season. Two other species of Tamarix, *viz.*, *T. gallica* (known by the name of jhau) and *T. dioica*, might also be tried. These latter are shrubs, and are found abundantly on moist alluvial lands, or on river banks; they also appear to thrive in soils impregnated with salts. The lower and damper portions of the reserves at Gursikran and Chherat would probably suit them well. The seed ripens during the cold season.—*(Agricultural Ledger Series.)*

The Campbell-Walker Prize for Forestry at the Dehra Dun Forest School.

We have received, from the Inspector-General of Forests, for publication, the following letters, which will fully explain themselves.

SIR,

In reply to your letter No. 782 dated 8th August 1893, I have to inform you that the suggestion made by the Director of the Forest School, *viz.* "that the interest on the Rupees 540-9-0, 'amounting to about Rupees 20 yearly, should be spent in a prize 'of books to be awarded to the best Madras Student in Forestry in 'the Forest Examinations, under the orders of the Board of 'Control," commends itself to me and the majority of my fellow subscribers as suitable for adoption.

I enclose a letter from Colonel I. Campbell-Walker, which I beg you will kindly send to the Editor of the *Indian Forester* with a request that, with his kind permission, it and this letter may be published for general information in that journal.

Yours truly
S. C. MOSS.

ARMY AND NAVY CLUB,
PALL MALL, S. W.
24th September, 1894.

DEAR MR. MOSS,

I am in receipt of yours of 9th ultimo. with it enclosures informing me of the foundation of an Annual Prize (Silver Medal) for Forestry in my name at the Forest School, Dehra. I highly appreciate the honor done me and I shall feel much obliged by your conveying my thanks to the other contributors. I was already well repaid for anything I had done to promote the interests of the Department and its Staff by the good work and support of yourself and others who are a credit to any service.

But I shall never forget this kindly mark of your esteem and regard, through which the memory of my humble efforts will be perpetuated at the Forest School.

I need scarcely add that my interest in the Department and its Officers of all classes, remains unbroken and if I can ever be of service to it or them in any way, you may command me.

With all best wishes for you all,
Believe me,
Yours very faithfully,
J. CAMPBELL-WALKER.

Revised Rules for the entry of Native Non-Commissioned Officers into the Forest Department.

I.—Any such officer, who is recommended for the purpose by his Commanding Officer, may apply to a * Conservator of Forests in the Bengal Presidency, or to the Director of the Imperial Forest School at Dehra Dun, for permission to follow, at that institution, the course of instruction in the Upper or English class, with a view to secure, after successfully passing through the School and obtaining a Ranger's certificate, an appointment as Forest Ranger in one of the Provincial Forest Services.

* *Addresses of Conservators of Forests in the Bengal Presidency.*
Bengal Circle, Darjeeling.
Assam Circle, Shillong
N.-W. P and Oudh—
School Circle, Dehra Dun.
Central Circle, Naini Tal.
Oudh Circle, Naini Tal.
Central Province—
Southern Circle, Nagpur.
Northern Circle, Jabalpur.
Berar Circle, Amraoti.
Punjab Circle, Lahore.
Upper Burma—
Western Circle, Mandalay.
Lower Burma—
Pegu Circle, Rangoon.
Tenasserim Circle, Moulmein.

II.—The Forest Officer to whom application is made must be satisfied—

(*a*) that the candidate will not be more than 30 years of age when he enters the School.

(*b*). that he has been sufficiently well educated, especially in Mathematics and English, to enable him to follow the School course with advantage and to obtain a Ranger's certificate;

(*c*) that he is of good constitution and active habits, and possesses fair ability and powers of observation, as well as such physical qualifications as are required for a good Forest Officer.

III.—If the conditions in the preceding rule are satisfied and the candidate is accepted by a Local Government for an appointment in the Provincial Forest Service, he may be admitted to the School, and be allowed to receive the stipend admissible to private students under rule 12 (ix) of the rules appended to Circular No. 11-F., dated 28th June 1894. While at the School, with the exception that he need not attend drills, he will in all respects be subject to the rules appended to that Circular.

IV.—On obtaining a certificate at the conclusion of the Schoo curriculum, the candidate will be eligible to be appointed as Ranger. On being so appointed, he will be subject, as regards future promotion, to the regulations of the Forest Service for the time being. As regards other conditions of service, the candidate either shall, on obtaining his appointment to the Forest Department, take his discharge from the Army, and then 12 months of his period of instruction at the Forest School will count as service under article 388, rule 4, of the Civil Service Regulations; or he may serve in the Forest Department and be transferred to the Native Unattached List under the conditions in Army Regulations India, Volume II, Part II, and in that case he will qualify for the special rates of pension admissible under military regulations, (See Army Regulations, India, Volume I, Part II.)

V.—During the School course the candidate will be seconded in his corps, which he shall rejoin if he fails in obtaining a certificate.

These rules have been framed to replace those of Circular 25F of November 13th, 1880, which were found impossible to work in connection with the recent new Rules for the Forest School. They do not apply to the Presidencies of Madras and Bombay; but the Governor General in Council recommends them to the consideration of the Governments of those Presidencies.

Remission of Forest Revenue to Treasury through the Post Office

The Government of India have called for report whether this arrangement might not be adopted with advantage in most Provinces. It arose in Bengal, where the Conservator, finding Treasuries few and far between, suggested the use of the Money Order system and remittances through the Post Office ; and after some discussion he was allowed to introduce the new system which was found to be an improvement

IV-REVIEWS

Forest Inspection Reports on the Districts of Salem, North Coimbatore, Anantapur, Bellary and Vizagapatam.

Mr. Popert's report on Salem, though short, is interesting, chiefly on account of the evidence it brings of the importance of substituting systematic working of even a temporary and rough character for systems of sale by permit, etc., which only tend to deterioration of the stock. This is what the Conservator says of the District Forest Officer, Mr Brasier, in this connection.

" I was pleased with the strides made by your present District 'Forest Officer in this direction. He has opened coupes practically 'throughout the district, and the permit system is becoming a 'thing of the past. He deserves particular credit for the judicious 'manner in which he has effected the change ; during my tour I 'heard only one complaint which proved to be entirely unfounded, 'and which owed its origin to a contractor of adjoining zemin 'forests who, under the old system of indiscriminate felling 'throughout the forest, was most probably able to smuggle a con-'siderable quantity of forest produce from Government Forests 'under cover of zemin permits."

The badness of the staff and its venality are the chief matters upon which the Conservator has remarked. It may be hoped that the effects of forest education may soon shew themselves, but Salem is, we should think, a difficult District in which to stop bad practices, which have probably gone on for several years.

The note on NORTH COIMBATORE, has some points of interest. First of all we reproduce Mr. Cherry's suggestion for the management of the Vellamundi Revenue on the Bhavani River which is a poorly stocked piece of forest, a good deal overrun with prickly pear. These suggestions are :—

"The reserve should be closed to permit-cutting.

'The avaram shrub should not be worked for three years.

'Cattle grazing should be limited to one head for every 5 'acres.

'The reserve should be divided into blocks of about 1,000 acres 'and each year a block (beginning with the most easterly which 'should be taken up this year) should be operated on as follows :—

'(1) The prickly-pear must extracted and either burnt, or 'used to temporarily fence the block.

'(2) All blanks must be run over with a plough and seeds 'of tamarind, turinji, *Albizzia lebbek*, neem, satinwood, *Pithecolo-'bium Saman*, avaram and any other suitable seeds must be freely 'planted in the plough furrows just before the rains.

'(3) The existing growth should be retained as shelter until 'the seedlings are sufficiently established, when

'(4) The existing growth should be coppiced under standards 'departmentally and removed with as little injury as possible to 'the seedlings.

'(5) The blocks that are thus being treated should be entirely 'closed to grazing and must be fire protected.

'If the District Forest Officer can manage a block on the 'west at the same time, so much the better, but as the growth on 'the west is very much better and there are few or no blanks, it 'may be possible to begin coppicing there at once and so provide 'any village fuel that may be necessary to make up the deficiency 'caused by stoppage of permits.

'The object is, to get the whole area re-stocked with seedlings 'and then the present pollarded growth coppiced so as to get a 'more uniform growth in as few years as possible."

We do not quite understand (4) : is it meant that the whole forest is to be coppiced (it contains about 19,000 acres) in 19 years? We suppose so, and if so we hope to find in future reports, accounts of the result. It seems doubtful whether it will *pay* but there can be no doubt as to its sylvicultural advantage.

The Conservator recommends a hedge of the valuable Coimbatore hedge plant, *Balsamodendron Berryi* being planted by means of cuttings.

He very properly animadverts on the practice he discovered of keeping dynamite and fuses loose about the Divisional Office. Like Mr. Popert, Mr. Cherry is also anxious to introduce a 'coupe' system of felling instead of sales by permit and we are glad to see that in this he is supported by the Collector and the Board of Revenue. North Coimbatore is lucky in being off the beaten track

and the Conservator can there carry out what would not be permitted by the amateur foresters in the adjoining District of Nilgiris.

The note on ANANTAPUR by Mr E D. M. Hooper, dated December 16th, 1892, is long and detailed, but there is little which is of sufficient general interest for our readers. The Anantapur District is a very interesting one in many ways to a Forester and the absence of more than a very scanty record of the improvement of growth of the forests seems a pity. Some of the Reserves were almost bare when taken up first and inspection notes ought to record the improvement in growth which is naturally more easily noticed by a Conservator, who inspects at intervals, than by a Divisional Officer who sees the forests frequently. The following, on *Hardwickia*, probably will, however, be of interest. "*Hardwickia* has made great strides since it has come under 'protection. The custom of pollarding the trees for the fibre of the 'shoots has been entirely stopped and the supply of seed has con-'sequently been enormously increased. Judging from what I 'have seen, I imagine that germination of the seed follows very 'soon after its fall with the early rains, but that the young plants 'dug down to their roots for one, if not for several years, each 'season putting on a stronger growth, which eventually persists 'in asserting itself."

Mr Hooper's note on BELLARY of January 1890, also contains very little of general interest, it is full of detail of more or less unimportant matters and the most noticeable thing is the recommendation bestowed by the Collector and Conservator on the native District Forest Officer, Mr. Nallasawmi Naidoo. It is disappointing to find no account of the progress of work in the Sandur leased forests

In Mr. Hooper's note of January 6th, 1893, on VIZAGAPATAM there is also comparatively little of interest It must have taken long to write, for it takes 26 pages of the Board's Proceedings, but the only extract we can find of any importance is the following, which Forest Officers in charge of Sal Forests in North India will be interested to read.

"*Natural Reproduction*—The species we are most concerned 'with the reproduction of in the Vizagapatam district differs in the 'various ranges. In Palkonda it is the sal (*Shorea robusta*), ac-'companied, however, by other accessory species, some being so 'generally distributed as to be of distinct advantage or it may be 'harmful in their action, and, as an instance of the latter, I would 'mention that in parts of Palkonda the growth of *Lebedieropsis* is 'remarkable and apparently detrimental to the spread of sal, to the 'growth of which—always an interesting study—Mr. McArthy has 'already devoted some attention. It here appears as a sapling 'pole rising generally to 30 feet with a diameter of 5 inches, though 'occasionally found 40 feet high and 1 foot in diameter. The

'original stools are still living in most cases and there is little or 'no evidence in old stumps or pollarded trunks of the former 'growth having assumed large dimensions. The sharply defined 'limit of the local distribution of the sal is here quite as evident as 'in Upper India where it often forms an almost pure regular forest 'growth and apparently takes possession of abandoned cultivation 'on the exact area of which it proceeds to rear an even growth 'of coppice Left to itself, the sal as a species tends to monopolise 'the soil, and gradually the herbaceous growth below it becomes 'reduced to a mere carpet of a few straggling annuals in which, 'even grass grows with difficulty. As a consequence, the only fuel 'to feed the forest fires is the carpet of fallen dry leaves and such 'ringed and completely dead trees as are lying or still standing. 'There is very little to entice animals to graze in ordinary sal forest, 'and once the poles have asserted themselves and form canopy, the 'presence of animals does but little harm. In the extreme youth 'of the species it will be found, however, that cattle must be ex-'cluded and danger from fires most carefully guarded against."

British Forest Trees.

We have received from the Author a copy of "British Forest Trees" by Mr. J. Nisbet, D. Œc., Deputy Conservator of Forests in Burma, an interesting treatise in which the leading principles of sylviculture, as applied to the principal species of British forest trees, are ably set forth in a concise and readable manner. As the Author himself informs us in the preface, the work is not one of original research, but is to a considerable extent compiled from the best German Authors, to the information obtained from which, has been added the results of the Author's own personal observations and experience.

After a short introductory historical sketch of the forests and woodlands of Britain, the requirements of forest growth are then considered. The main portion of the book is then devoted to a description of each of the principal species of trees which form or are capable of forming pure forests. Each species of tree is systematically and separately described, its distribution characteristics and requirements as regards soil, situation, light, &c. being given, and also its peculiar liabilities to damage from external influences and disease. Its sylvicultural treatment is then discussed at some length, distinction being made between the cases where it forms pure forest and where it is grown as the ruling species in mixed forest. The reproduction of the species both by natural and artificial means is also briefly considered.

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* British Forest Trees by J. Nisbet, D. Œc. London. Macmillan & Co., 1893. 6s.

The latter portion of the book is devoted to the minor species of trees both indigenous to Europe and introduced, which do not usually form pure forests in Britain. Many of these are necessarily disposed of very briefly but a full description of the more important of them is given on the lines indicated above.

On the whole, the work is a well written one and must have entailed on the Author a considerable expenditure of time and labour. It might, perhaps, have been a little more conveniently arranged in chapters, but this, if a defect, is a minor one and we trust that "British Forest Trees" will receive the approval it deserves from all foresters and others interested in the growth and management of forests and woodlands in Britain.

Of course, as was to be expected of Messrs Macmillan and Co., the general get up, print and binding of the book are excellent and the price moderate.

VI.—EXTRACTS, NOTES AND QUERIES.

Afforestation in England.

A representive of the *Chronicle* recently had an interview with Professor Schlich, lately the head of the Indian Forestry Department, and now attached to the Royal Indian Engineering College at Coopers hill. Both Professor Schlich and his colleague, Mr. W. R. Fisher, are experts in the whole science of Forestry, and Dr. Schlich is the author of the valuable "Manual of Forestry" from which the *Chronicle* quoted the other day in suggesting a scheme of afforestation which would serve the purposes of adding to the national wealth, reclaiming waste land, preserving and adding to our national store of timber, saving a huge import from wood-growing countries, and at the same time securing work for the workless. Professor Schlich has been the subject of an interesting experience which throws a vivid light on the problems of Irish Government opened up by "X" in the *Fortnightly Review*. In the latter part of 1885, Dr. Schlich, in the course of a tour in Ireland, made some investigations into the possibilities of a scheme of afforestation for that country. The late Lord Carnarvon heard of them, was greatly interested, and suggested an interview. About that time, however, occurred the break-up of the Conservative Government, and the only result of Lord Carnarvon's overtures was the writing of a pamphlet, in which Dr. Schlich proposed the re-afforestation of waste lands as an adjunct to a general scheme of State purchase. Lord Carnarvon's successor took no notice of the suggestion, and Ireland was again left to sink more deeply into the morass of hopeless poverty.

As it happens, however, the problem in England is very nearly as pressing as that in Ireland. Dr. Schlich calculates that there are 26,000,000 acres of waste land in the United Kingdom, of which nearly 6,000,000 are situated in England. One-half of this could be profitably laid down in forest land, but the planting of 6,000,000 acres would suffice to replace our annual import of timber. The case is all the more urgent because, as Dr. Schlich pointed out to our representive, there is every probability that this supply will be greatly curtailed. Canada, for instance, is wearing out her forests and killing the goose that lays the golden eggs. However, nearly every country but our own is waking up to the necessity of economising its heritage of trees.

"Is it not true," asked our representive, "that we are practically the only country that does nothing for the preservation and extension of our national store of forests?

"Well," said Dr Schlich, "other nations are certainly waking up on the subject. The State is stirring in Belgium, which was very backward; and even in Russia, where forestry is still in the rough, progress has been made. In the United States there is a strong movement in favour of afforestation owing to the serious extent to which the timber is giving out."

"And what have we done?"

"Well," said Dr. Schlich, "we planted 14,000 acres of oak in the Forest of Dean from 1816 to 1825. But the thinnings have been too heavy, and the result has been that the trees have not attained a proper height-growth. Then we planted 9,000 acres outside Windsor Park about the same time. But Windsor has always been treated, not as a national forest, but as a royal shooting ground. Then there was a further plantation of 18,000 acres in the New Forest. But on the whole it is a fact that the old English forests are failing. It is useless for Mr. Auberon Herbert to speak of their æsthetic beauty and of the necessity of preserving them as they are, in order that ladies and gentlemen may paint them. Things have gone rather too far in England for that. My idea is that scenic beauty and usefulness might very well be combined in English woods. As things go, the forests are getting poorer and poorer, swampier and swampier, every year. In one particular, the soil becomes seriously deteriorated by the formation of what we foresters call 'pans.' In other words, the rain washes down particles of clay, which, mixing with the oxide of iron in the soil, forms a firm cohesive mass that has to be removed by iron tools. Much the same considerations apply to the great private forests. They are not treated on any regular plan. Now, the owner, wanting money, will order a wholesale clearance of trees; now again he will suffer whole forests to remain untouched for years. What these gentlemen, no less than the nation, want, is a systematic plan for dealing with forests on a regular system of thinning and renewal Unless forests are so managed that approximately the

same quantities of material are brought into the market annually, it is hopeless to expect forest industries to spring up and to realise good prices by the sale of the produce."

"As to the second point of my inquiry—is afforestation practical as a means of dealing with the problem of the unemployed? For instance, is it possible in winter?

"Certainly," said Dr. Schlich, "you can plant trees all through the winter, save only when it is freezing The principal work is, of course, the digging of holes for the planting, and that is clearly unskilled labour. In my 800 acres near Ascot, which I use for the instruction of my school, the labourers get 3s a day."

"As to the cost of a larger experiment in forestry," added Dr. Schlich, in answer to further questions, "I have calculated that a return may be obtained from all kinds of land, and it comes out, reckoning every possible outlay, and including compound interest on the money invested, at the rate of about 2¾ per cent. profit. As for the nature of the land which can be rendered profitable by afforestation, almost any kind is useful which can be obtained for £10 an acre, and that is always worth putting down in Scotch firs To take one item alone, you might save the 70,000 tons of mining props which are every year exported from Bordeaux. There is no reason," added Dr. Schlich emphatically, "why every stick of these should not be grown at home. From the labourers' point of view, as I have said, the peculiar advantage of forestry work is that it can be done when no other work is available."

"You think then that an experiment in afforestation could very well be made?"

"Yes," said Dr. Schlich, "and though, of course, the exact return would depend upon the quality of the land, you could rely on some such result as I have indicated The cost of planting would perhaps average about £6 an acre, £7 or £8 where there was a 'pan' and £4 or £5 where there was none Supposing the nation laid out £60,000 for the purchase and planting of 7,000 acres, the work would provide labour, say, for forty days per acre at the slackest time of the year"

"As to organisation—what would you suggest?"

"I would say in general terms that it would be possible to associate an experiment of this kind with the office of the Commissioners of Woods and Forests, if not with the Agricultural Department. An area might be taken, say, a series of blocks, each extending to 2,000 acres, and an expert employed to draw up a plan of operations The country has plenty of qualified practical foresters, and the planting might very well be done by them The danger of failure would occur in the subsequent treatment of the woods. This could be provided against by instituting a course of schooling in forestry for land surveyors and agents Perhaps this new school might be established in connection with the

Coopers hill College, which might very well institute a short course, hold technical examinations, and possibly confer diplomas. Or an efficient course might be established in connection with one of the agricultural colleges. Then, if the experiment succeeded, a specially qualified commissioner might be appointed to superintend the work of the growing department. That the culture of woods is profitable there can be no manner of doubt.—(*Daily Chronicle.*)

The Fall of the Leaf.

Mr. A. Ransom writes as follows in the *Bedfordshire Times*:—The above title will suggest to many minds a kind of moralising that is the opposite of exhilarating. Indeed, I hold that the common sentiment connected with the fall of the leaf is false both in fact and taste. The fall of the leaf is no more a symbol of death than are any of the wonderful and beautiful changes that take place in the order of nature. A leaf is not a living entity —it is but a temporary organ developed for a definite purpose and for a definite time, to be dropped off when it has done its work for the plant that produced it. In fact—as I shall presently show—its fall is, to the twig on which it hung, rather a sign of life than of death. And then how beautifully nature effects this disposal of its no-longer useful organs ! We have this year had an exceptionally brilliant example of this. It would be necessary almost to exhaust the artist's colour-vocabulary in order to describe the tints that our trees and shrubs, our trailers and our climbers, have lately assumed. Some golden leaves still hang on the poplars and limes, rich brown ones on the oaks and beeches, and the creepers on our houses still give us crimson and scarlet pencillings of every possible tone. The effect is heightened by the admixture of the so-called evergreens, which afford all shades of green as a kind of background against which the brilliant hues of autumn stand out in the most beautiful contrast. In passing, it may be remarked that these evergeens are in reality "evergreen" only in language. Their leaves do not last as long as the trees that bear them, any more than do the leaves of the trees whose boughs are now beginning to show graceful outlines against the crisp autumn skies. An " evergreen" is a tree that keeps each summer's leaves for two or more seasons, and thus, though it every year loses as many leaves as it produces, it always has one or more seasons' leaves upon its boughs.

In our climate the fall of the leaf is so conspicuous a stage in the year's plant life, that a brief explanation of the process by which it is effected cannot fail to interest even the least scientific reader. The process is simple and can be easily explained ; and when understood it will show the reader that it is quite a mistake to look upon the fall of the leaf as an emblem of death. The change of season that accompanies it and makes it necessary may have some unpleasantness

connected with it in the minds of the infirm, the delicate, and of those who have allowed the errors of our modern civilisation to rob them of the healthy man's birthright of sympathy with nature in all her moods and phases. But this is quite another thing, and does not justify the sickly sentiment about autumn which I have mentioned above.

To understand the fall of the leaf, it is necessary to know, in the first place, that the leaf, when alive and performing its functions, is as intimately and organically connected with the twig as the arm of a man is with his body. The food, which it is the business of the leaf to manufacture, is conveyed from the leaf to the parts of the plant that need it, along channels that pass from all parts of the leaf into the inner structure of the plant. This can be proved roughly by trying to break off a vigorous leaf—the leaf does not easily separate from the twig at its point of juncture with it, any more than the arm of a man does from his body. But when the feeding season of the leaf draws to a close an organic change of beautful simplicity takes place. Just where the leaf stalk leaves the twig, there is formed a thin microscopic layer of cork, right through the leaf stalk, cutting asunder, not only the soft matter of the stalk, but also the tough fibres that run from the leaf into the wood of the twig. Now, this thin film of cork possesses two qualities which enable it to effect its purpose at the place where it forms. It is impervious to water, and it is very easily torn. The cork layer being impervious to water; there can no longer be any passage of sap from the leaf into the twig, or *vice versâ*. The leaf is no longer a part of the living system of the plant ; and as it has no independent power of vitality. there is set up in it at once a fresh series of chemical and physical, changes producing all those varieties of tint which make our trees so beautiful at this time of the year.

Bnt this is not all. So far the leaf is still hanging upon the tree, though it is no longer a vital part of the tree. Receiving no supply of water from the tree, and losing by constant evaporation the water which it contained when the layer of cork was first formed, it dries up and both the blade and the stalk—and especially the stalk—shrink. The twig, however, does not shrink—if anythings, it swells Thus the end of the stalk, where the cork layer is formed, is strained. The stalk is no longer thick enough to cover the spot to which it is attached. Something evidently, must tear ; the cork layer tears asunder, and the leaf falls.

Nor is this quite all. Were a man's arm to be torn off at the shoulder joint, there would be caused an ugly wound So, if a green leaf is torn off in summer there is caused a wound in the twig, very different from the slight mark which is left by the falling leaf. If the simultaneous fall of the leaves of a tree in the autumn left the tree covered with ugly wounds on all its twigs, the tree would suffer very materially, perhaps die. But the use of the thin cork layer above comes in here again. It not only makes a clean cut, through the fibres of the leaf stalk, but covers

the scar on the twig with a waterproof covering that prevents the outflow of sap from within, and protects the spot against injurious influences from without.

A simple illustration of the fact that such a change as that above described does take place, may be easily found by anyone walking among trees in winter. A little observation will be sure to discover a twig, broken in summer, but still hanging loosely to the tree. Such a twig will still have its leaves on it. They are dry and dead and curled up, but they still hang tightly to the twig This is because the twig died before the cork layer was formed between it and its leaves. Thus it keeps its dead leaves as part and parcel of itself : while the tree on which it hangs has naturally and normally shed its leaves.

Thus the fall of the leaf is only a process of life. In a climate like ours, leaves must do one of two things—they must either fall when the cold weather and short days come, or they must cover themselves with a surface that will resist the cold and help the leaf to sleep—or dose—through the months of diminished daylight. Our evergreens have adopted the latter expedient : their leaves are very leathery, and, in the cases of high trees exposed to wintry storms, they are narrow and thread-like, and thus permit the cold blasts to sweep harmlessly among them.—(*Timber Trades Journal*)

English Forestry.

Referring to the appointment of Mr. Stafford Howard to the vacant Commissionership of Woods and Forests, the London *Daily Chronicle* regrets that a practical forester was not selected. Our contemporary continues :—" Had such an appointment been made, a gigantic field of usefulness would have been opened out. As things stand, we are virtually the one country in Europe in which the State cares nothing whatever for its forests—that great treasure of the common people—and neither knows nor teaches even the elements of the science of afforestation. Our national wealth of timber is under no skilled guardianship whatsoever. No steps are taken either adequately to preserve or to increase it. In Germany, more than half the forest area is under the direct or the indirect control of the State, and the stock of timber is subject to constant supervision and renewal. Here nothing is done. We have a small and poorly endowed school for the training of candidates for the Indian Forest Service at the Engineering College at Coopers Hill, within a stone's throw of the magnificent but grossly neglected woods of Windsor. But our own woodland area is suffered to go to wreck At the same time we annually import some 6,000,000 loads of timber, and as many of the sources of supply are contracting, we may, within an ascertainable period, be face to face with a timber famine. In other words, we are—or were a few years ago—

spending some £13,000,000 sterling per annum on timber and timber products, while we have, according to the calculation of Mr. Schlich, the principal professor of Forestry at Coopers Hill, some 6,000,000 acres of waste land, which could, and should, be laid down as forests. Mr Schlich estimates that we might annually plant some 300,000 acres employing at least 15,000 labourers which would sustain a population of 75,000 souls. After forests had been created, and (say in some forty years) we had entered on our new possessions, we should be, says Mr Schlich, in a position to employ regularly some 100,000 workers, or a population of half a million people. It so happens that the opportunity for a national experiment in afforestation occurs at the very doors of the great Inferno of English poverty—the East End. There is plenty of waste land available between Barking and Pitsea, and Essex, especially that part of it which borders on London, is famous for its growth of English trees.—(*Timber Trades Journal.*)

Canadian Timber

The *Montreal Daily Star* gives some figures to show the extraordinary advance in timber values, consequent upon the rapid felling of the pine forests. To an inexperienced eye there may be hardly an evidence at first glance of the disappearance of the pine. The hardwoods with which the pine is interspersed are usually left standing to a considerable extent, and so are the smaller pines, so that even a well-cut country will still look splendidly wooded. No doubt the time will come when it will be carefully re-cropped. But the commercial value is largely gone, and with it the natural desirability, for the cutting of the pine greatly lessens the value of the woods as vast reservoirs, holding the snows in spring and the rains of summer so as to feed steadily the innumerable streams of the water-sheds. Consequently spring floods and summer droughts for the cleared lands in the valleys follow close on the lumberman's axe. A certain amount of attention has been aroused by the rapid retirement of the pine. The Ontario Government has recently attempted to enforce strict precautions against fire, and it has also appropriated, as a provincial park, an enormous reserve near Lake Nipissing, thirteen hundred square miles, of which nine hundred are pine timber, situated on one of the chief natural watersheds of the province. But a great deal more than this is necessary if the Canadian pine forests are not soon to disappear like the tracts of Maine and New York. Enlightened men here are urging the establishment of regular systems of arboriculture, such as prevail in several of the chief countries of Europe, notably in France. It is hoped also that the Quebec Government will follow the lead of the Ontario Government in establishing a natural park on some of the main watersheds.—(*Timber Trades Journal.*)

An Arboretum in Austalia.

Professor Brown, of the Dookie Agricultural College, Victoria, who is well known in Scotland, and the northern parts more particularly, has successfully established an arboretum in connection with that Institution, of which he has for several years been the Principal The *Australasian* of August 19th contains a description of the arboretum and the progress which has already been made in the cultivation of trees and shrubs suitable for the climate of that colony. Two years ago, Professor Brown obtained the sanction of the Council of Agricultural Education to establish an arboretum to contain the principal native and foreign economic timber trees for the purpose of general reference, experimentation, and special education with his lectures. The first duty was to determine upon a list of trees which would have a fair chance of success under the particular conditions, for, while experimentation was a valuable element in the idea, there was, of course, no necessity for expenditure upon what experience and other knowledge of certain species said must be useless. Accordingly, Mr. Brown made out such a list, and submitted them to Baron Von Mueller, as well as to Mr. J. Ednie Brown, Director-General of Forests, New South Wales; Mr. G. Perrin, Conservator of Forests, Victoria; and Mr. D. Martin, Secretary for Agriculture. Each gave his opinion, and it is interesting to note that out of the 268 distinct species recommended, they objected to only half a dozen, and advised the additions of fifteen others. Professor Brown then selected seven acres of ground immediately south of the college building, having an eastern aspect, good virgin soil of medium texture, and abundant natural drainage. This was sub-soiled, thoroughly tilled, and fenced from rabbits. The whole space is kept free from weeds, and every attention given to each specimen, but no artificial watering whatever has been allowed. Planting is done at 25 ft. apart each way, and progress already made is such as to warrant the expectation that, in the course of a very few years, a very good arboretum will have been established in Victoria. The Council and the Secretary for Agriculture are giving Professor Brown every reasonable encouragement in the realisation of his project.—*North British Agriculturist.*

Patent Wood Fibre.

Mr. James P. Pile, builder and contractor, of the Brunswick Saw-mills and Joinery Works, 83, Great Brunswick Street, Dublin, has brought out a new "Patent Wood Fibre" which is well destined to become a useful article of Irish manufacture.

This wood fibre is, we are informed, being extensively used for bedding in many of the union workhouses and other large institutions in Ireland, and is strongly recommended as being more

comfortable, cleanly, and healthy than straw. It has the further advantages of being lighter and lasting longer, while the odour of the pine renders it an essentially sanitary bed likely to be of value in hospitals and infirmaries. It is also valuable for dog bedding, the well known quantities of pinewood shavings being present in a far more efficient form.

The maker points to its efficiency for packing purposes, mineral water manufacturers and export bottlers, finding it more suited to their needs than any other material. A special fine fibre, made of pure white wood, is prepared for silversmiths, biscuit manufacturers, confectioners, &c, and another form of the pitch pine fibre has been highly approved of by many important hospitals for its antiseptic qualities.

With this addition to his building and contracting business, as well as the conduct of his saw-mills and joinery works, Mr. James P. Pile should find his trade develop to a large extent during the coming winter. There should be a large market for his patent woodfibre which can be delivered at comparatively little cost in most Irish towns and villages. (*Timber Trades Journal*).

Pice Packets of Quinine.

A few months ago we published a short account of the new arrangements by which quinine is sold at Post Offices in Bengal, the Central Provinces and elsewhere, in small packets at 1 pice each. Our readers may be interested in the following figures shewing the value of sales during 1893.

	Rs.		Rs.
January ...	189	July ...	1,305
February ...	177	August ...	3,399
March ...	207	September ...	1,990½
April ...	330	October ...	3,045½
May ...	523	November ...	4,262
June ...	872	December ...	3,402
		TOTAL Rs. ...	19,702

The number of packets actually sold was 1,446,900 which is not bad for the first year, and shews that the new scheme has 'caught on' and bids fair to be a great success.

The Brandis Prize Fund.

The Director of the Forest School at Dehra Dun has received from Sir Dietrich Brandis, K C. I. E., a cheque for £5 as a contribution to this Fund so as, to use his own words, to "induce 'Dehra Dun students to contribute more good articles to the 'Forester' particularly on sylvicultural matters."

Sir Dietrich says that he has read with pleasure the articles to which Honoraria have already been awarded, and we hope that our readers will agree with us in thanking him for his kindness and that old Dehra Dun students will show an eager competition to profit by his bounty.

Tapping of a Para Rubber Tree in Ceylon.

A recent despatch from the Secretary of State gives an account of the tapping of a Para Rubber tree in the Henaratgoda Botanic Garden in Ceylon by Dr. H. Trimen, F. R. S. The tree was 15 years old and had a circumference of 6 feet 5 in. at 3 feet from the ground. It was tapped in 1888 and gave 1lb. 11¾ oz; in 1890, and gave 2lb. 10oz.; and in 1892 giving 2lb. 13 oz.—total 7lbs. 2¾oz. in 6 years. The rubber was valued by Messrs. Hecht Levis and Kahn of 21 Mincing Lane at 2s. 3d. to 2s. 6d. per lb. So that the annual money yield of a tree, in good climate and well cared for can be put down at 2s. 10d. and the cultivation ought to be profitable.

The Classified List of Forest Officers.

The last of these lists published was that of January, 1893 and we have long been waiting to see the next one. A recent order of the Government of India, has decided that it is now too late for the July 1st number to issue and that consequently that one will be left out. We hope that this means that the January 1st, 1894, List is to come out at once. The delay was apparently due to difficulties in the list of the combined Provinces, Punjab, Central Provinces, Berar and Coorg.

IIV.-TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

January 1st, 1894.

EAST INDIA TEAK.—The importation of Timber and Planks has been :—

	1887.	1888.	1889.
	9,100 Loads	12,270 Loads	19,407 Loads .....
	12,241 ,, ...	16,618 ,, ...	15,899 ,, ...

And the deliveries

	1890.	1891.	1892.	1893.
Imports	16,000 Loads	16,588 Loads	7,923 Loads	12,687 Loads
Deliveries	17,140 ,, ...	14,371 ,, ...	10,455 ,, ...	12,646 ,,

The trade in what is probably the finest wood, for all practical and wholesale purposes, that is grown, has been disappointing in London during 1893. It is no doubt the all-prevailing desire for cheapness, regardless of quality, in a year of depressed general

trade, which has prevented this wood from holding its own for general uses, and confined it, more or less exclusively, to shipbuilding and dockyard work. The importation to London has been small, and the consumption also, though the latter has been swollen by large drafts upon the London stocks for Admiralty contracts. The French blockade of Bangkok at one moment threatened to suspend the Siamese supply, but the demand was too languid for this to cause any excitement in British markets. These Siamese shipments have again held their own well with those from Burmah as regards quality and manufacture, and except for Government work the wood from the two countries is much of the same value. So long, however, as the British Admiralty officials retain their prejudice in favour of Moulmein or Rangoon Teak, the Siamese shipments must remain commercially at a disadvantage, which will be reflected in the prices obtainable. The London trade during the year has run more largely than before in the direction of sawn planks and scantling, and even of planed boards manufactured abroad.

Rosewood.—East India.—Considerable sales were made early in the year at reduced prices, but the demand steadily declined, and since then operations have been of a more or less retail character with a continual downward tendency in prices. The import was limited to two parcels, both of which were sold; but some lots landed in the previous year still remain on hand. Present stock, although not at all heavy, is in excess of current small demand. Quotations are from £5 to £8 per ton.

Satinwood.—East India.—There was a good demand for figury *logs* which realised up to 2s. 4d. per foot super, but plain wood was dull of sale; the import was not at all heavy, but it passed very slowly into consumption and some wood still remains on hand, therefore only large and figury logs should now be sent, *Planks* and *boards*.—There were again no shipments, and they are not wanted.

Ebony.—East India.—The import, which was very light, all came *viâ* Colombo, arrived during the first half of the year. The demand was dull for several months, but with reduced stocks, and no Ceylon wood offering, sales were more readily made, without, however, any tangible advance in prices; as there is now no stock in first hands, fresh imports of sizeable, good logs would be likely to find buyers at better figures than those last realised, but to what extent, depends very largely upon the continued scarcity of Ceylon wood. Present quotations are from £6 to £8 per ton.

Padouk.—The imports from the Andaman Islands were again limited to two cargoes, and, as in the previous year, the chief part was transshipped to the United States. There is more enquiry here, but whilst the bulk of the import is so quickly sent away there is but little chance for an increased home trade; nevertheless, prices have hardened, and quotations are now from 3s. to 3s. 6d. per foot cube for logs and planks.

MARKET RATES OF PRODUCTS.

(*Tropical Agriculturist, January 1894.*)

Cardamoms,	per lb.	2s.	to	2s.6d.
Croton seeds	per cwt.	20s.	to	27s.6d.
Cutch	,,	20s.	to	23s.
Gum Arabic, Madras	,,	15s.	to	45s.
Gum Kino	,,	£15	to	£18
India Rubber, Assam	per lb.	1s.7d.	to	2s.3d.
,, Burma	,,	7d.	to	1s.1½d.
Myrabolams, Bombay	per cwt	9s.6d.	to	11s.3d.
,,	,,	5s.	to	6s.9s.
,, , Godavari	,,	7s.3d.	to	7s.9d.
Nux Vomica, good	,,	6s.	to	8s.
Orchella, Ceylon	,,	22s.	to	28s.
Redwood	per ton	£3.	to	£3-10s.
Sandalwood, logs	,,	£35	to	£55
,, chips	,,	£9	to	£30

Cawnpore Price Current.

January 25th, 1894.

	Per Maund.						
	R.	A.	P.		R.	A.	P.
Aonla fruits—dried	0	12	0	to	0	12	6
,, leaves dried, bruised ...	1	12	0	to	2	0	0
Babul bark	0	7	0	to	0	8	0
Bahera	1	10	0	to	1	12	0
Lac Stick	20	0	0	to	22	0	0
Myrabolams	3	0	0	to	3	8	0
Moonj grass	0	8	0	to	0	12	0
,, twine	2	0	0	to	3	0	0
Bees-wax	54	0	0	to	60	0	0
Gum Babul	12	0	0	to	13	0	0
,, Mixed	9	0	0	to	10	0	0
Nux Vomica	8	8	0	to	8	9	0

X.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

2nd January, 1894.—No. I-F.—The undermentioned officers, who have been appointed by Her Majesty's Secretary of State to the Forest Department of India, are appointed to be Assistant Conservators of the 2nd grade, with effect from the dates specified opposite their names, and are posted to the Provinces noted below :—

Mr H. G. Billson, North-Western Provinces and Oudh, 27th November, 1893.
" C. C. Abbey, North-Western Provinces and Oudh, 20th November, 1893.
" R. M. Williamson, Berar, 16th November, 1893.
" R. C. Milward, Central Provinces, 27th November, 1893.
" F. Linnell, Central Provinces, 27th November, 1893.
" C. O Hanson, Central Provinces, 27th November, 1893.
" W F. Perrée, Bengal,
" C. B Smales, Burma,
" E. P. Stebbing, Bengal,
" E. E. B. Lloyd, Assam,
} 1st December, 1893.

10th January, 1894.—No. 45-F.—The following transfer is ordered in the interests of the public service :—

Mr. H. S. K. Edie, Assistant Conservator of Forests, Central Provinces—to Assam.

12th January, 1894.—No. 57-F —On return from the privilege leave granted in the Notification of this Department, No. 1111 F., dated the 19th October last, Mr. J. S Gamble, Conservator of Forests, 1st grade, resumed charge, from Mr. A. E. Wild, Conservator, 3rd (officiating 2nd) grade, of the School Circle, North-Western Provinces and Oudh, and of the Directorship of the Imperial Forest School, Dehra Dun, with effect from 4th January, 1894.

No. 61-F.—The following transfer is ordered in the interests of the public service :—

Mr. E. M. Coventry, Assistant Conservator of Forests, Berar,—to the Punjab.

12th January 1894 —No. 52 Home Department (*Public*).—It is hereby notified for general information that the undermentioned officers will take rank in the third class of the Supplementary Graded List of Civil Officers not reserved for members of the Civil Service of India, published with the Warrant of Precedence for India in Home Department Notification No. 2082, dated the 1st November 1877, that is to say, in Article 77 of the said Warrant.

Deputy Conservators of Forests, drawing a salary of Rs. 800 a month and over.

Assistant Inspector-General of Forests.

Deputy Director of the Imperial Forest School.

2.—MADRAS GAZETTE.

20th December, 1893.—The three months' leave to Ranger Narayanswami Aiyar notified at page 1282, Part II of the *Fort St. George Gazette*, dated 12th September 1893, is extended by three months, *i. e.*, until 1st March 1894.

28th December, 1893 —The acting promotions of R. Balaji Singh and A. P. Ramachendra Mudaliar as Rangers, 4th and 5th Grades, respectively, notified at page 1506, Part II of the *Fort St. George Gazette*, dated 24th October 1893, are to continue until 1st March 1894 during Ranger Narayanswami Aiyar's absence on leave.

Promotion.—T. Arumuga Mudaliar, Acting Forester, 1st Grade North Arcot, to be Ranger, 5th Grade, with effect from 15th October 1893.

4th January, 1894.—No. 17.—Postings of Forest Officers.

No.	Names of officer.	District.	Nature of charge.	Remarks.
1	Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, 1st Grade.	North Malabar Division.	District Forest Officer.	Transfers to take effect from date of Mr. Eber Hardie's taking furlough.
2	Mr. C. D. McArthy, Assistant Conservator of Forests, 1st Grade.	North Arcot...	Do.	
3	Mr. V. Alwar Chetty, Extra Assistant Conservator of Forests, 2nd Grade.	Viragapatam..	Do.	
4	Mr J. H. B. Brougham, Deputy Conservator of Forests 3rd Grade	Nellore ..	Do.	Confirmation f acting District Forest Officers.
5	Mr. H. B. Bryant, Assistant Conservator of Forests, 1st Grade.	South Coimbatore	Do.	
6	Mr. J. L MacO. O'Leary, Assistant Conservator of Forests, 2nd Grade.	Kistna ..	..	To do duty under the District Forest Officer, Kistna.

8th January 1894.—One month's leave, on forfeiture of pay granted to T. Subramania Mudaliar, Temporary Forest Surveyor, Bellary, in office order No. 74 of 1893-94, is cancelled.

8th January 1894 —No. 1. –Mr. C. A. Eber Hardie, District Forest Officer, North Malabar, is granted furlough for one year, with effect from or after 1st February 1894, under article 371 of the Civil Service Regulations.

16th January 1894.—No. 10.—

No.	Name and designation of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. R McIntosh, District Forest Officer, Cuddapah.	Assistant Conservator of Forests, 1st Grade.	Deputy Conservator, 4th Grade.	Permanent.	With effect from 18th January 1894.
2	Mr. A.B Jackson, District Forest Officer, Godavari.	Do.	Do.	Do. ..	Do.

16th January 1894.—Mr. T. N. Hearsey, Acting District Forest Officer, Anantapur, will, on relief by Mr. Murray, from Karnool, proceed and take charge of the Sub-Division, Kurnool District, with headquarters at Nandyal.

18*th January* 1894.—The leave of absence to Ranger M. Jambunatha Sastri, notified at page 1749, Part II, of the *Fort St. George Gazette*, dated 19th December 1893, is extended to 27th January 1894.

3.—BOMBAY GAZETTE.

6*th January*, 1894.—Mr. L. S. Osmaston, Assistant Conservator of Forests, First Grade, reported himself for duty on Working Plans to the undersigned on the 19th December 1893, in the afternoon, as directed in Government Resolution No. 9161, dated 13th December 1893, Revenue Department, and was attached to the Conservator's office, Central Circle.

11*th January*, 1893.—Messrs. W. R. Gaunde, Extra Assistant Conservator of Forests, First Grade, and V. G Tumné respectively delivered over and recieved charge of the Sub-Division Office, Násik, on the 12th December last, after office hours.

10*th January*, 1894.—No. 223.—Mr. G. A. Hight, Deputy Conservator of Forests, Second Grade, has been allowed by Her Majesty's Secretary of State for India an extension of furlough for six months.

No. 238.—Mr. E. G. Oliver, Divisional Forest Officer, Sholápur, passed an examination in Maráthi on 5th January 1894.

4.—BENGAL GAZETTE.

10*th January*, 1894.—No. 168.—In continuation of Notification No. 4394 For., dated the 28th October 1893, it is hereby notified that Mr. F. Trafford, Assistant Conservator of Forests, has been granted a further extension of leave for one month on medical certificate by the Secretary of State.

5.—N. W. P. AND OUDH GAZETTE.

9*th January*, 1894.—No. 87—II—392C·—Mr. N. Hearle, Deputy Conservator of Forests, in charge of the Dehra Dún Forest Division, furlough out of India for ten months, with effect from the 1st February 1894.

9*th January*, 1894 —No. 88.—II. 392C.—Pandit Sadanand, Extra Assistant Conservator of Forests, attached to the Jaunsar Forest Division, to the charge of the Dehra Dún Forest Division as a temporary measure.—

19*th January*, 1894.—No. 201.—II. 403C·—Mr. A. G. Hobart-Hampden, Deputy Conservator of Forests, in charge of the Kumaun Forest Division of the Central Circle, privilege leave for thirty days, with effect from the 25th January 1894.

19*th January*, 1894.—No. 202.—II. 403C.—Mr. F. B. Bryant, Deputy Conservator of Forests, and Working Plans Officer, Central Circle, to hold charge of the Kumaun Forest Division of the Central Circle, in addition to his own duties, during the absence on leave of Mr. A. G. Hobart-Hampden, or until further orders.

6.—PUNJAB GAZETTE.

3rd *January*, 1894 —No. 1.—On return from the three months, privilege leave granted to him in *Punjab Government Gazette* Notification No. 422, dated 5th of August 1893, Mr. F. O. Lemarchand, Deputy Conservator of Forests, resumed charge of the Kángra Forest Division on the afternoon of the 7th December 1893, relieving Mr. C. Somers Smith, Assistant Conservator of Forests, who will remain attached to the Kangra Division till further orders.

6th *January* 1894.—No. 12 —Punjab Government Notification No. 622, dated 8th December 1893, is hereby cancelled

6*th January*, 1894 —No. 13.—To Punjab Government Notification No. 299, dated 3rd May 1893, *add*—

Mr. P. H. Clutterbuck, Provisional Assistant Conservator of Forests. 1st Grade, and Officiating Deputy Conservator of Forests, 4th Grade (on privilege leave), to Provisional Assistant Conservator of Forests, 1st Grade:

Mr. A. M. F. Caccia, Provisional Assistant Conservator of Forests, 1st Grade. and Officiating Deputy Conservator of Forests, 4th Grade, to Provisional Assistant Conservator of Forests, 1st Grade, with effect from 16th December 1892.

6*th January*, 1894 —No. 14 —To Punjab Government Notification No. 300, dated 3rd May 1893, *add* —

Mr. P. H. Clutterbuck, Provisional Assistant Conservator of Forests, 1st Grade, on privilege leave, to officiate as Deputy Conservator of Forests, 4th Grade, with effect from 10th January 1892.

6*th January*, 1894.—No. 15.—To Punjab Government Notification No. 643, dated 9th December 1893, *add*—

Mr. G. F Taylor, Officiating Deputy Conservator of Forests, 3rd Grade (on privilege leave), to be Officiating Deputy Conservator of Forests, 2nd Grade, with effect from 26th September 1893.

6*th January*, 1894.—No. 16.—In Punjab Government Notification No. 644, dated 9th December 1893, *for* "Mr G. F. Taylor, Officiating Deputy Conservator of Forests, 3rd Grade," *read* "Mr. G. F. Taylor, Officiating Deputy Conservator of Forests, 2nd Grade," and omit the words "Mr. G. F. Taylor, Officiating Deputy Conservator of Forests, 3rd Grade, to officiate as Deputy Conservator of Forests, 2nd Grade.

6*th January* 1894.—No. 17.—To Punjab Government Notification No 648, dated 9th December 1893, *add*—

Mr. A. M. F Caccia, Provisional Assistant Conservator of Forests, 1st Grade, and Officiating Deputy Conservator of Forests, 4th Grade, (on privilege leave), to Provisional Assistant Conservator of Forests, 1st Grade, with effect from 27th November 1893.

6*th January*. 1894 —No. 18.—Consequent on the return of Mr. F. O Lemarchand, Deputy Conservator of Forests, 2nd Grade, the following reversions will have effect from 8th December 1893:—

Mr. L. G Smith, Provisional Deputy Conservator of Forests, 3rd Grade, and Officiating Deputy Conservator of Forests, 2nd Grade (on privilege leave), to Provisional Deputy Conservator of Forests, 3rd Grade;

Mr. H. Moore, Officiating Deputy Conservator of Forests, 2nd Grade, to Officiating Deputy Conservator of Forests, 3rd Grade :

Mr. F C Hicks, Provisional Deputy Conservator of Forests, 4th Grade, and Officiating Deputy Conservator of Forests, 3rd Grade, to Provisional Deputy Conservator of Forests, 4th Grade ;

Mr. P. H. Clutterbuck, Provisional Assistant Conservator of Forests, 1st Grade, and Officiating Deputy Conservator of Forests, 4th Grade, to Provisional Assistant Conservator of Forests, 1st Grade.

6th January, 1894 —No. 19.—With reference to Punjab Government Notification No. 642, dated 8th December 1893, Mr. A. M. F. Caccia, Provisional Assistant Conservator of Forests 1st Grade, returned from three months' privilege leave on the 14th December 1893.

6th January, 1894.—No. 20.—Consequent on the return from furlough of Mr. A. M. Reuther, Deputy Conservator of Forests, 3rd Grade, the following reversions shall have effect from 15th December 1893 :—

Mr. H. Calthrop, Officiating Deputy Conservator of Forests, 3rd Grade, to Deputy Conservator of Forests, 4th Grade ;

Mr. A. W. Blunt, Officiating Deputy Conservator of Forests, 4th Grade, to Assistant Conservator of Forests, 1st Grade.

6th January, 1894.—No. 24.— In Punjab Government Notification No. 667, dated 16th December 1893, *for* "Mr. A. M. Reuther, Provisional Deputy Conservator of Forests, 3rd Grade, on furlough, to be Deputy Conservator of Forests, 2nd Grade," *read* "Mr. A. M. Reuther, Provisional Deputy Conservator of Forests, 3rd Grade, (on furlough), to be Deputy Conservator of Forests, 3rd Grade."

19th January, 1894.—No. 51.—In Punjab Government No. 14 dated 6th January 1894, *for* "10th January 1892" *read* "10th January 1893."

19th January, 1894.—No. 52.—In Punjab Government Notification Nos. 13, 14 and 18, dated 6th January 1895, *for* "Mr. P. H. Clutterbuch" *read* "Mr. P. H. Clutterbuck."

19th January, 1894.—No. 53.—Consequent on the return of Mr. L. Gisborne-Smith, Provisional Deputy Conservator of Forests, 3rd Grade, from privilege leave, the following reversions shall have effect from 26th December 1893 :—

Mr. H. A. Hoghton, Officiating Deputy Conservator of Forests, 3rd Grade, to Deputy Conservator of Forests, 4th Grade.

Mr. A. V. Monro, Officiating Deputy Conservator of Forests, 4th Grade, to Assistant Conservator of Forests, 1st Grade.

19th January, 1894.—No. 54.—Mr. H. S. K. Edie, Officiating Assistant Conservator of Forests, 1st Grade, proceeded on privilege leave for two months and five days on the 2nd January 1894.

19th January, 1894.—No. 55.—Consequent on the departure of Mr. C. P. Fisher, Officiating Deputy Conservator of Forests, 4th Grade, on privilege leave, the following promotion shall have effect from 8th January 1894 :—

Mr. A. V. Monro, Assistant Conservator of Forests, 1st Grade, to officiate as Deputy Conservator of Forests, 4th Grade.

20th January, 1894.—No. 60.—On return from the three months' privilege leave granted to him in *Punjab Government Gazette* Notification No. 458, dated 28th August 1893, Mr. L. Gisborne-Smith, Deputy Conservator of Forests, resumed charge of the Hazára Forest Division, relieving Bhái Sádhu Singh, Extra Assistant Conservator of Forests, on the forenoon of the 2nd January 1894.

Bhái Sádhu Singh remains attached to the Hazara Forest Division.

20th January, 1894.—No. 64.—Mr. C. P. Fisher, Officiating Deputy Conservator of Forests, proceeded on the three months' privilege leave granted him in *Punjab Government Gazette* Notification No. 580, dated 16th November 1893, making over charge of the Kulu Forest Division to Mr. A. M. Reuther, Deputy Conservator of Forests, on the afternoon of 7th January 1894.

7—.CENTRAL PROVINCES GAZETTE.

4th January 1894.—No. 70.—The following officers appointed by Her Majesty's Secretary of State for India to the Indian Forest Service reported their arrival at Bombay on the 27th November 1893, and at Nagpur on the afternoon of the 30th idem :—

Mr. R. C. Milward, Assistant Conservator of Forests.

Mr. F. Linnell, Assistant Conservator of Forests.

Mr. C. O. Hanson, Assistant Conservator of Forests.

Mr. R. C. Milward is posted to the Northern Circle, and Messrs. F. Linnell and C O. Hanson are posted to the Southern Circle.

4th January 1894.—No. 73.—Privilege leave for two months and five days, under Article 291 of the Civil Service Regulations, is granted to Mr. H S. K. Edie, Assistant Conservator of Forests, Chhindwara, with effect from the date on which he may be permitted to avail himself of it.

11th January 1894 —No. 218.—On return from the three months privilege leave granted him by Notification No 3944, dated the 22nd August 1893, Mr. M. Muttannah, Extra-Assistant Conservator of Forests, is posted to the charge of the Nimar Forest Division.

11th January 1894 —No. 219.—Mr R C. Milward, Assistant Conservator of Forests, is posted to the Betul Forest Division as Working-Plans Assistant.

11th January 1894 —No. 220.—On return from the three months' privilege leave granted him by Notification No. 4196, dated the 7th September 1893, Mr. A. M. F. Caccia, Assistant Conservator of Forests, is posted to the Hoshangabad Forest Division as Working-Plans Assistant.

11th January 1894.—No. 221 —With reference to Notification No. 220, dated the 11th instant, Mr. A. M. F. Caccia, Assistant Conservator of Forests, assumed charge of his duties on the forenoon of the 14th December 1893.

11th January 1894.—No. 222.—On return from the three months' privilege leave granted him by Notification No. 5123, dated the 2nd November 1893, Mr. S. G. Pranjpe, Extra-Assistant Conservator of Forests, is posted to the Mandla Forest Division as Working-Plans Assistant.

11th January—1894 —No 223 —Mr. R C. Thompson, Extra-Assistant Conservator of Forests, on being relieved of the charge of the Betul Forest Division by Mr H. Moore, Deputy Conservator of Forests, is posted to the Saugor Forest Division as Working Plans Assistant

20th January—1894 —No 425.—Mr. H. S. K Edie, Assistant Conservator of Forests, transferred from the Chhindwara Forest Division to the Direction Division, made over charge of his duties at Chhindwara to the Conservator of Forests, Southern Circle, Central Provinces, on the afternoon of the 14th December 1893, and joined the Direction Division on the afternoon of the 14th December 1893

20th January, 1894 —No. 426 —Mr. P. H Clutterbuck, Officiating Deputy Conservator of Forests and Working Plans Officer, is posted to the Chhindwara Forest Division. He received charge of his duties at Chhindwara from the Conservator of Forests, Southern Circle, Central Provinces, on the forenoon of the 27th December 1893.

20th January, 1894.—No 427 —Mr H S K Edie, Assistant Conservator of Forests, availed himself, on the forenoon of the 2nd January 1894, of the two months and five days' privilege leave granted him by Order No 73, dated the 4th instant.

20th January, 1894.—No 435.—Mr. F S Barker, Deputy Conservator of Forests, has been granted, by Her Majesty's Secretary of State for India, six months leave on medical certificate in further extension of the medical leave granted him by Notification No 3559, dated the 2nd August 1893

20th January, 1894 —No 444.—Mr. F. O Lemarchand, Deputy Conservator of Forests, 3rd Grade, Punjab, who has been transferred to the Central Provinces, is posted, on arrival, to the charge of the Balaghat Forest Division.

8 —BURMA GAZETTE.

21st December 1893 —No 38 —With reference to Revenue Department Notification No 486 (Forests), dated the 8th December 1893, Mr C B Smales, Assistant Conservator of Forests, reported his arrival at the headquarters of the Lower Chindwin division on the forenoon of the 18th December 1893.

21st December, 1893 —No. 12 —With reference to Revenue Department Notifications Nos. 409, 411 and 413 of the 21st October 1893, Mr D L Richardson, Myoôk, reported his arrival at Shewbo on the afternoon of the 6th instant for forest settlement duty.

23rd December, 1893.—No 9.—Mr T A. Hauxwell, Deputy Conservator of Forests, reported his return to duty from the privilege leave granted him in Revenue Department Notification No. 331 (Forests), dated the 25th August 1893, on the afternoon of the 22nd December 1893.

23rd December, 1893.—No. 10.—Mr. J Messer, Assistant Conservator of Forests made over and Mr T. A Hauxwell, Deputy Conservator of Forests, received, charge of the Agency and Salween-Attaran divisions and the Tenaserim Forest Surveys on the afternoon of the 22nd December 1893.

28th December, 1893.—No. 507.—Mr. R. F Lewis, Extra Assistant Conservator of Forests, 4th Grade, on probation, is confirmed in his appointment with effect from the 2nd November, 1893.

28th December, 1893.—No. 13.—Mr. C. W. B. Anderson, Extra Assistant Conservator of Forests, reported his return on the afternoon of the 2nd December 1893, from the privilege leave granted him in Revenue Department Notification No. 381 (Forests), of the 7th October, 1893

28th January 1893. No. 14.—With reference to Revenue Department Notification No. 480 (Forests), of the 4th December, 1893, Mr R. M. Kavanagh and Mr. C. W. B. Anderson, Extra Assistant Conservators of Forests, respectively made over and received charge of the Mandalay Revenue subdivision on the afternoon of the 4th December, 1893.

28th December, 1893.—No. 15.—With reference to Revenue Department Notification No. 481 (Forests), dated the 4th December, 1893, Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, received charge of the Myadaung subdivision of the Katha division on the afternoon of the 12th December, 1893.

29th December, 1893.—No. 13.—With reference to Revenue Department Notification No. 484F., dated the 7th December, 1893, Mr H. Carter, Assistant Conservator of Forests, reported his arrival from leave on the forenoon of the 12th December 1893.

29th December, 1893.—No. 14.—With reference to Revenue Department Notification No. 488F., dated the 11th December, 1893, Mr. H. Carter, Assistant Conservator of Forests, assumed charge of the Working Plans division on the afternoon of the 16th December, 1893.

2nd January, 1894.—No, 1.—With reference to Revenue Department Notification No. 488 (Forests), dated the 11th December, 1893 Mr. F. J. Branthwaite, officiating Deputy Conservator of Forests relinquished charge of the Working Plans division on the afternoon of the 7th December, 1893.

2nd January, 1894.—No. 2.—With reference to Revenue Department Notification No. 488 (Forests), dated the 11th December, 1893 Mr J. Messer, Assistant Conservator of Forests, assumed charge of his duties at Toungoo of the 29th December, 1893.

2nd January, 1894.— 1894.—No. I.—With reference to Revenue Department Notification No. 491 (Forests), dated the 13th December, 1893 Mr. E. S. Carr, Deputy Conservator of Forests, received charge of the Bhamo division, from Mr. C. R. Dun, Assistant Conservator of Forests, on the forenoon of the 25th December, 1893.

5th January, 1894.—No. 2.—With reference to Revenue Depatment Notification No.492 (Forests), dated the 13th December, 1893, Mr. C. R. Dun, Assistant Conservator of Forests, reported himself for duty in the Shwebo district on the forenoon of the 28th December, 1893.

10—HYDRABAD RESIDENCY GAZETTE.

9th January, 1894.—No. 6.—Mr. R. M. Williamson, appointed an Assistant Conservator of Forests, 2nd grade, by Her Majesty's Secretary of State for India, arrived at Amraoti on the forenoon of the 28th November, 1893, and has been posted to the Ellichpur Forest Division.